DECEMBER 1949 S. M. No. 1-1490

*How to repair ...*

# Kodak FLASH SUPERMATIC SHUTTERS

- For Kodak Medalist II Camera
- With Kodak Ektar f/4.7 127mm., f/3.7 105mm., and f/7.7 203mm. Lenses

*Eastman Kodak Company · Rochester 4, N.Y.*

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# KODAK FLASH SUPERMATIC SHUTTER

## *FOR THE KODAK MEDALIST II CAMERA*

# TROUBLE CHART

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Solenoid will not work flash shutter | Shutter not designed for use with a solenoid. | |
| Synchronizer scale does not operate | Scale rivet pulled out. | Fit new rivet and readjust the scale. |
| Shutter does not trip easily | Bind in the operating DISK, figure 11, at the bearing NUT. | Clean thoroughly. Use powdered graphite. Blow off excess. |
| | Possible burr on TRIGGER and collar ASSEMBLY, figure 5. | Burnish the trigger and collar assembly at the point where it contacts the MAIN DRIVE ASSEMBLY, figure 7, when in a set position. |
| No Kodatron contact | The BLADE CONTROLLER CONTACT STUD, figure 14, is not touching the CONTACT SPRING, figure 8. | Adjust the contact spring so that it touches the contact stud on the blade controller when the blades are almost fully opened. It is possible to make the adjustment after removing the front lens mount. |
| Shutter blades remain open on high speeds | Plate blade studs missing on mechanism plate. | Replace and restake the studs carefully to avoid swelling the top of the studs. |
| | Split shutter blades. | Replace the shutter blades. |
| | Loose studs on the shutter blades. | Replace the shutter blades. |
| Shutter does not set | The TRIGGER LATCH, figure 5, is not returning to its proper position after the shutter has been released. | The trigger latch may be bent and binding on the speed index plate or cover. |
| | | It may be necessary to reduce the tension on the TRIGGER LATCH SPRING, figure 3. |
| The winding lever does not hold when the shutter is set | The winding gear pinion is loose on the gear. | Replace the pinion gear assembly. |
| | The CLUTCH ASSEMBLY, figure 4, is slipping. | Replace the clutch assembly. |
| | The latch point on the contact LEVER COMPLETE, figure 8, is damaged. | Replace the contact lever complete. |
| Shutter speeds slow | Retard gears dirty. | Remove and clean the retard gears. |
| | The MAIN DRIVE SPRING, figure 7, is weak. | Replace the main drive spring. |



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| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Shutter speeds slow (cont'd) | Shutter blades binding. | Remove and clean the shutter blades. If necessary, replace the blades. |
| | Excessive retard sector travel. | Swedge the SPEED CONTROL RING, figure 2, at the area controlling the slow speed. (See figure 1.) |
| | Blade controller with contact stud binding. | Re-form the diaphragm retainer plate to allow more clearance between the plate and the mechanism plate. Be sure the blade controller is flat. |
| Shutter speeds fast | Insufficient retard sector travel. | File the speed ring at the area controlling the fast speed. (See figure 1.) |
| | Insufficient pallet engagement (on speeds 1/10 second or slower). | 1. Remove material on the speed control ring in the area of contact with the pallet bracket stud. |
| | | 2. Check for bind of the PALLET BRACKET, figure 6, against the retard gear PLATE COMPLETE. |
| | Gear train dirty. | Clean the gear train thoroughly. |
| | Too much tension on the main drive spring. | Replace the main drive spring. |
| Shutter blades buckle | NOTE: The following conditions may contribute to blade buckle singly or in combination. | |
| | Loose studs on shutter blades or MECHANISM PLATE, figure 12. | Replace the shutter blades. Restake the studs on the mechanism plate carefully to avoid swelling the top of the studs. |
| | BLADE CONTROLLER with contact stud, figure 13, not flat. | Straighten or replace the blade controller. |
| | Shutter blades not flat. | Replace the blades. |
| | Mechanism plate not flat. | Replace the mechanism plate. |
| | Blade controller too loose or too tight on the central hub of the mechanism plate. | Replace the blade controller. |
| | Too much play between the mechanism plate and the diaphragm retainer PLATE WITH WINGS ASSEMBLED, figure 13, due to retainer plate being bowed. | Replace the diaphragm retainer plate with wings assembled. |
| | Burr or roughness on diaphragm retainer plate with wings assembled. | Replace the plate. |

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Shutter blades buckle (cont'd) | Blades opening too far. | File and burnish the blade controller LATCH at point "A". (See figure 7.) |
| | Blades closing too far. | Swedge mechanism plate at "B", figure 14. |
| | No clearance between the blade controller latch and the BLADE CONTROLLER LUG, figure 14, when the shutter is in the tripped position. | Swedge the mechanism plate at point "C," figure 14, such that this point acts as a stop for the SETTING LEVER with stop stud, figure 12. |
| Shutter operates instantaneously on B (bulb) | The lug on the side of the rectangular opening in the trigger is out of adjustment. | Bend the lug on the trigger in or out until proper adjustment is achieved. |
| Both flash settings are below the millisecond tolerances (fast). | The tension is too great on the WINDING GEAR SPRING, figure 4. | Relieve the tension slightly on the winding gear spring. However, there must be enough tension on the spring to permit the winding lever to carry through on both the F and M flash settings. |
| Both flash settings are above the millisecond tolerances (slow) | There is not enough tension on the winding gear spring. | Place the winding gear spring under slightly greater tension. Care should be taken during this adjustment not to disturb the trigger latch. |
| | The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE, figure 2. | Try lubricant, or replace the WINDING LEVER, figure 2. |
| The F (short stroke) is within the millisecond tolerances but the M (long stroke) is fast | THE FLASH RETARD PALLET, figure 3, is not meshing properly with the winding lever. | With special Tool No. 657, turn the eccentric post so that the pallet will mesh firmly in the teeth of the winding lever. Make certain the post is tight on the cover after making this adjustment. |
| | The flash retard pallet may be binding on the speed index plate. | The index plate will be marked at the binding point. File the plate at this point to allow clearance for the pallet. |
| Constant flash short | Cracked contact insulating BLOCK, figure 8. | Replace the contact insulating block. The shutter should be checked independently of the camera. If the shutter is working properly, refit it to the camera. If the short persists, check the case insulating bushing NUT, figure 8, to see that it or any part of the contact wire is not touching the focusing tube or light guard. |
| | The contact spring may be bent and touching either the contact lever or the cover. | Re-form the contact spring. |
| Both flash settings are extremely fast | The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon. | Add more tension to the trigger latch spring. |

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Both flash settings are extremely fast (cont'd) | The end of the trigger latch is bent back, toward the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades. | Re-form the end of the trigger latch by bending it slightly toward the winding gear.<br><br>After the shutter has been assembled, it can be checked to see if the shutter blades will open before the winding lever opens them.<br>1. Set the shutter.<br>2. Set the winding lever.<br>3. Holding the winding lever down, release the shutter. The shutter blades should not open while the winding lever is down. |

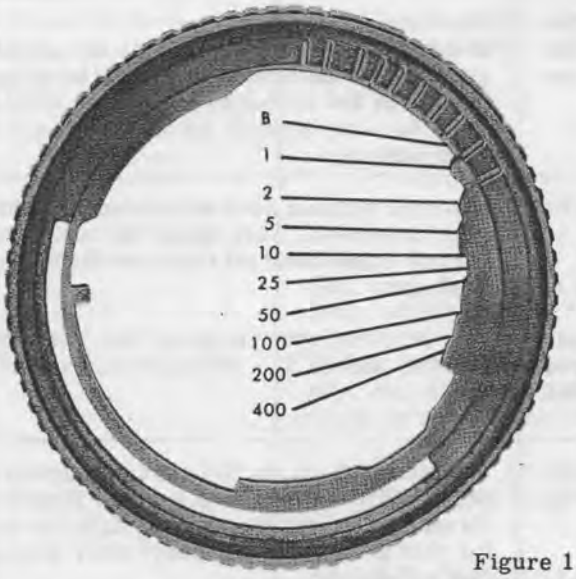

Figure 1

# DISASSEMBLY AND REASSEMBLY

DIAPHRAGM CONTROL RING

The sequence of disassembly is as follows:
1. Front lens mount, using Tool No. 501-0.
2. Diaphragm control ring RETAINER WITH SYNCHRO SCALE, figure 2.
3. Diaphragm control RING SPRINGS (one or two).
4. DIAPHRAGM CONTROL RING.

The sequence of reassembly is as follows:
1. Diaphragm control ring, fitting the notch opposite the pointer over the projecting lever on the DIAPHRAGM RING, figure 2.
2. Diaphragm control ring springs (one or two).
3. Diaphragm control ring retainer with synchro scale.
4. Front lens mount, using Tool No. 501-0.

SPEED CONTROL RING

The sequence of disassembly is as follows:
1. Diaphragm control ring, paragraphs 1-4 above.
2. DIAPHRAGM CLICKSTOP SPRING, figure 2.
3. Speed and diaphragm INDEX PLATE and the SPEED ring CLICK STOP SPRING.
4. SPEED CONTROL RING.

CAUTION: If the WINDING LEVER is disturbed, the flash timing will have to be readjusted.

The sequence of reassembly is as follows:
1. Speed control ring with shutter in tripped position. Be sure the projecting lug on the BULB LEVER ASSEMBLY, figure 5, the studs on the retarding SECTOR WITH STUD, figure 6, and the PALLET BRACKET with stud assembly are resting against the inside edge of the speed control ring and are not underneath the ring.
2. Speed ring click stop spring. The crimped side of the spring should face toward the back of the shutter.
3. Speed and diaphragm index plate.
4. Diaphragm click stop spring.
5. Diaphragm control ring, paragraphs 1-4 above.

WINDING LEVER

The sequence of disassembly is as follows:
1. Diaphragm control ring, paragraphs 1-4 above.
2. Speed control ring, paragraphs 2-4, above.
3. WINDING LEVER, figure 2.

The sequence of reassembly is as follows:
1. Apply a thin film of grease (Texaco Unitemp-RCX169 Grease) to the teeth of the winding lever.
2. Set the shutter.
3. Winding lever, with the sixth or seventh tooth from the left meshed with the WINDING GEAR, figure 4. Place the WINDING GEAR SPRING in tension by giving two and one-quarter strokes to the winding lever, lifting and replacing the lever after the first and second strokes. This should be the

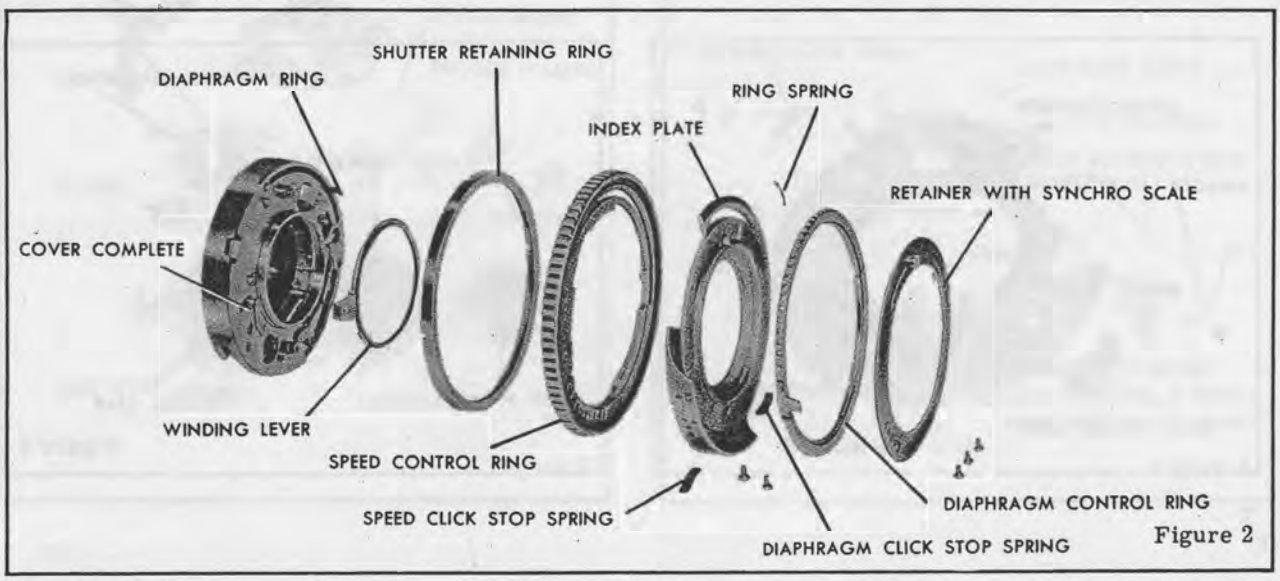

Figure 2

approximate setting for the flash synchronization of the shutter.

CAUTION: Do not touch the TRIGGER LATCH, figure 5, as it may release the winding gear spring tension.

Trip the shutter and lightly hold the winding lever down around the central collar on the cover. As the shutter is tripped, the end of the latch should fall into the slot on the cover. If it does not, add more tension on the TRIGGER LATCH SPRING, figure 3. Check for a bind between the trigger latch and the TRIGGER ASSEMBLY, figure 5, at the point of attachment. The winding lever should contact the trigger latch; push the latch out of the slot in the cover and open the shutter blades. After the shutter has been tripped, the latch should return to a position where it is resting on the ledge just above the small slot in the cover.

After the trigger is depressed, allow it to return to its proper position very slowly. If there is too much tension on the trigger latch spring, it will tend to retard the action of the latch and the trigger.

4. Speed control ring, paragraphs 1-5, page 7.

COVER COMPLETE

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. TRIGGER LATCH SPRING, figure 3.
5. TRIGGER LATCH, figure 5.
6. High speed spring CAM, figure 7, and the HIGH SPEED SPRING.
7. FLASH RETARD PALLET, figure 3.
8. SHUTTER RETAINING RING, figure 2.
9. COVER COMPLETE, figure 3.

The sequence of reassembly is as follows:

1. Cover complete.
2. Set the shutter.
3. Trigger latch, with the long bent end of the latch contacting the inner edge of the contact LEVER COMPLETE, figure 8. Be sure the latch does not bind.
4. Trigger latch spring; do not fasten securely. Lift the loose end of the spring over the trigger latch until it is at a point half way between the latch and the central collar. Then secure the spring. Place the spring against the outside edge of the trigger latch. The latch should be burnished and a thin film of grease (Texaco Unitemp-RCX169 Grease) applied at the point of spring contact.
5. Shutter retaining ring.
6. Winding lever, paragraphs 1-3, page 7.
7. Flash retard pallet, on the eccentric stud. Pull down the winding lever slowly and see that the pallet falls into every tooth of the lever. If it does not, turn the eccentric stud until the pallet is closer to the lever, using Tool No. 657. Care should be taken not to get the pallet too close to the lever, as this will cause the action of the lever to be rough.
8. High speed spring and the high speed spring cam.
9. Winding lever, paragraph 4, page 8.

WINDING GEAR, CLUTCH ASSEMBLY, and STAR WHEEL ASSEMBLY

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.

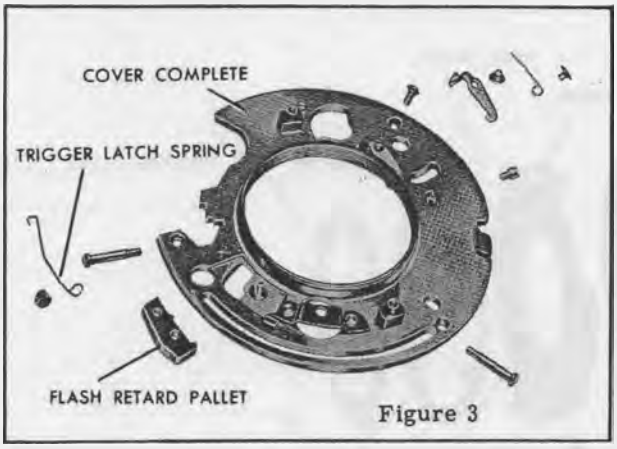

Figure 3

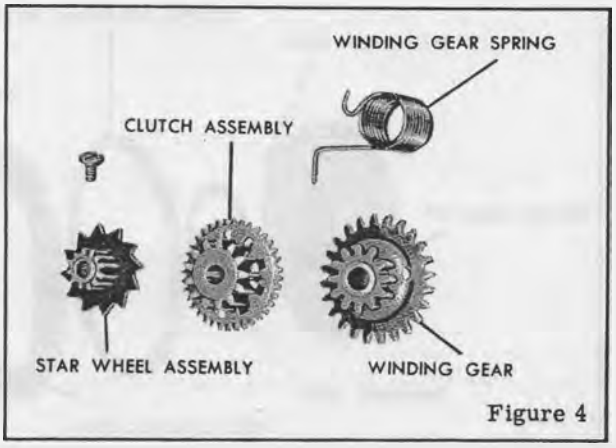

Figure 4

5. WINDING GEAR, figure 4, and the WINDING GEAR SPRING.
6. CLUTCH ASSEMBLY.
7. STAR WHEEL assembly.

The sequence of reassembly is as follows:

1. Winding gear and the winding gear spring on the WINDING GEAR STUD, figure 14.
2. Star wheel assembly.
3. Clutch assembly, with a thin film of grease (Texaco Unitemp-RCX169 Grease) on the underside of the assembly. The top gear on the clutch assembly should turn freely only in a clockwise direction when the lower gear of the clutch assembly is held tight.
4. Cover complete, paragraphs 1-9, page 8.

## TRIGGER ASSEMBLY AND BULB LEVER ASSEMBLY

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.
5. Unhook the MAIN DRIVE SPRING, figure 7, from the MAIN DRIVE SPRING STUD, figure 14.
6. TRIGGER SCREW, figure 5, TRIGGER SPRING, TRIGGER WASHER.
7. TRIGGER ASSEMBLY, bulb lever SPACERS, BULB LEVER ASSEMBLY, and BULB LEVER SPRING.

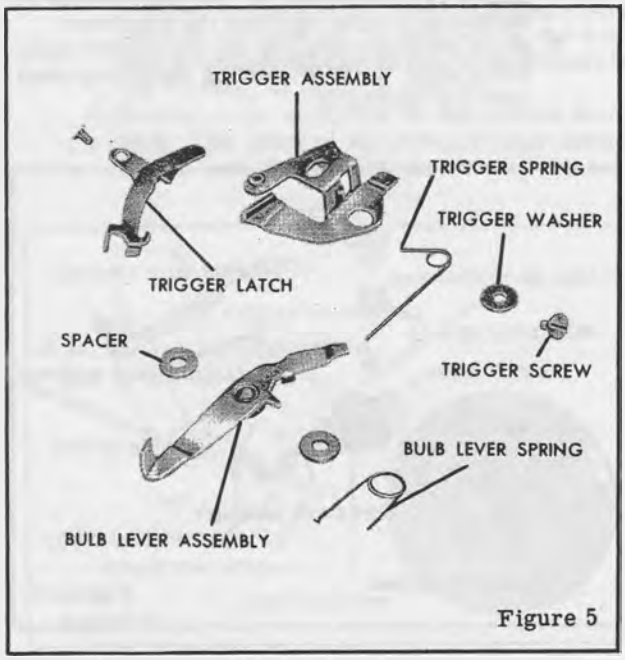

Figure 5

The sequence of reassembly is as follows:

1. One bulb lever spacer on the BULB LEVER STUD, figure 14.
2. With the bulb lever spring underneath, hold the trigger assembly with the oval hole up and insert the bulb lever assembly between that part of the trigger which is operated by the cable release and the upper part of the trigger. Insert the projecting lug on the bulb lever through the rectangular opening on the trigger.
3. Remaining bulb lever spacer between the top of the trigger and the top of the bulb lever assembly.
4. With the hooked end of the bulb lever spring turned in a clockwise direction, guide the parts down over the bulb lever stud. Insert the hooked end of the bulb lever spring into the small hole in the side of the case.
5. Trigger washer, trigger spring, and trigger screw. Lift the long end of the spring over the end of the main drive spring stud, and rest it against the stud.
6. Hook the loose end of the main drive spring onto the main drive spring stud.
7. Cover complete, paragraphs 1-9, page 8.

## RETARD GEAR TRAIN

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.
5. Retard GEAR PLATE SCREW, figure 6, near the retarding SECTOR WITH STUD.
6. Retard gear plate ANTI-BACKLASH SPRING.

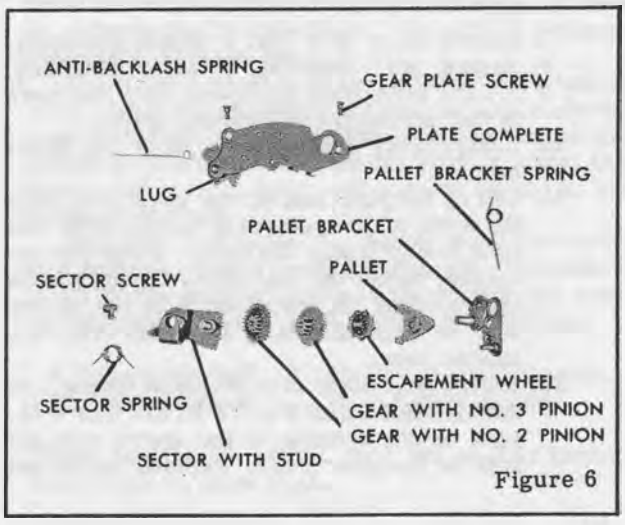

Figure 6

7. Unhook the retard PALLET BRACKET SPRING. Remove the remaining retard gear plate screw.
8. Retard gear PLATE COMPLETE.
9. Retard GEAR WITH NO. 2 PINION assembly.
10. Retard GEAR WITH NO. 3 PINION assembly.
11. ESCAPEMENT WHEEL with No. 4 pinion assembly.
12. Retard PALLET.
13. PALLET BRACKET with stud assembly and the pallet bracket spring.

NOTE: If the retard gears are dirty, clean all the parts of the gear train and the retard gear bearing holes in the mechanism plate thoroughly.

14. Retarding SECTOR SCREW. Unhook the retarding SECTOR SPRING.
15. Set the shutter.
16. Retarding sector with stud and the retarding sector spring.

The sequence of reassembly is as follows:

1. Retarding sector with stud and the retarding sector spring, with the long end of the spring at the top.
2. Retarding sector screw.
3. Place the long end of the sector spring against the inner side of the blade controller LATCH SPRING BUSHING, figure 7.
4. With the short end of the pallet bracket spring down, place the spring inside the pallet bracket with stud assembly. Allow the long end of the spring to extend out toward the case. Place the pallet bracket and the pallet bracket spring on the PALLET BRACKET SPRING STUD, figure 14. The long end of the spring should rest against the case.
5. Retard pallet.
6. Escapement wheel with No. 4 pinion assembly.
7. Retard gear with No. 3 pinion assembly.
8. Retard gear with No. 2 pinion assembly.
9. Retard gear plate complete, with the teeth of the gear facing the shutter blades.
10. Retard gear plate screw, near the pallet bracket.
11. Lift up the gear end of the gear plate until the teeth of the retarding sector with stud pass freely under the gear. Place the retarding sector so that when the gear teeth are meshed the outer edge of the sector will be approximately 1/8 inch from the shutter case.
12. Retard gear plate anti-backlash spring, on the RETARD GEAR PLATE STUD, figure 14. Line up the opening in the spring with the hole in the gear plate. Replace but do not tighten the remaining gear plate screw. The spring should be parallel to the shutter case. Holding the spring in this position, tighten the gear plate screw. Hook the end of the anti-backlash spring on the retard plate gear LUG, figure 6.
13. Place the long end of the pallet bracket spring against the inside edge of the lug on the retard gear plate complete.
14. Cover complete, paragraphs 1-9, page 8.

MAIN DRIVE ASSEMBLY

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.
5. Unhook the LATCH SPRING, figure 7, from the main drive LATCH.
6. Unhook the MAIN DRIVE SPRING from the main drive spring stud.
7. Set the shutter.
8. MAIN DRIVE ASSEMBLY, to which is attached the main drive spring.

The sequence of reassembly is as follows:

1. Apply a thin film of grease (Texaco Unitemp-RCX169 Grease) in the slot on the main drive assembly where it engages the stop stud on the SETTING LEVER, figure 12; on the MAIN DRIVE STUD, figure 14; on the LATCH, figure 7, at the point of contact with the LATCH SPRING, and on the latch where it contacts the RETARDING SECTOR STUD, figure 14. This area of the latch should be burnished before applying the lubricant.
2. Main drive assembly on the main drive stud, being sure to fit the setting lever stop stud into the assembly.

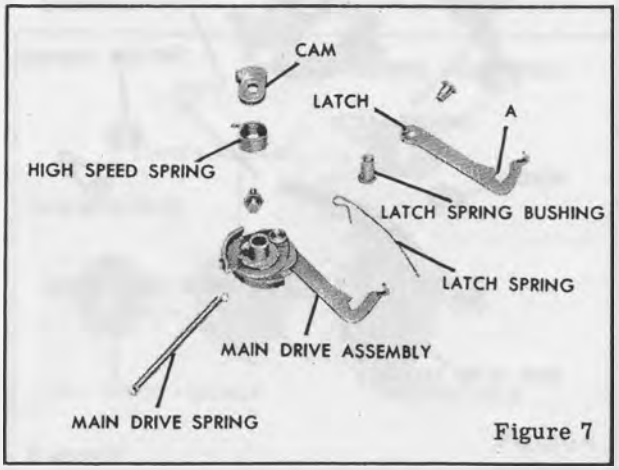

Figure 7

3. Close the shutter blades. Push the latch toward the BLADE CONTROLLER LUG. The cutout portion of the latch will come to rest around the lug. Place the loose end of the latch spring against the vertical lug on tip of the latch.
4. Main drive spring.
5. Cover complete, paragraphs 1-9, page 8.

FLASH CONTACT PARTS

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.
5. CONTACT WIRE BUSHING, figure 8, the contact WIRE, and the connector screw NUT.
6. CASE INSULATING BUSHING and the CONNECTOR SCREW.
7. CONTACT SPRING.
8. Contact insulating BLOCK.
9. Contact LEVER COMPLETE.

The sequence of reassembly is as follows:

1. Contact insulating block.
2. If a new contact lever is to be used, place the contact LEVER LATCH SPRING, figure 8, on the contact LEVER BUSHING, with the long end of the spring at the bottom. Lift the long end of the spring and rest it against the outside edge of the spring lug on the contact lever latch. Form the short end of the spring around the vertical part of the contact lever tail. Then place the CONTACT LEVER SPRING on the contact lever bushing. Bend the last 1/8 inch of the long end of the contact lever spring clockwise, with respect to the bushing, at least 15 degrees.
3. Contact lever complete on the contact lever stud. The ends of the contact lever spring should face in, toward the shutter blades. Turn the long end of the spring in a clockwise direction to place it in tension, and rest it in the groove in the case. Form the short end of the spring around the vertical part of the contact lever tail.

   CAUTION: The contact lever tail is burnished and must remain in that condition.

4. Contact spring.
5. Case insulating bushing with the flat side facing the outer rim of the case.
6. Connector screw and connector screw nut.
7. Contact wire bushing and contact wire.
8. Release the shutter and at the same time retard its opening action by placing one finger against the shutter SETTING LEVER, figure 12. Observe whether the BLADE CONTROLLER CONTACT STUD, figure 14, makes slight contact with the contact spring stud before the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.
9. Cover complete paragraphs 1-9, page 8.

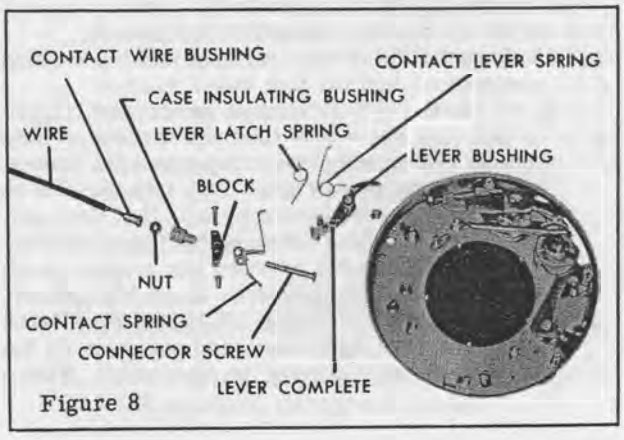

Figure 8

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter, allowing the winding lever to return slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open while the latch is still in the slot in the cover plate. To check for this condition, set the shutter and the winding lever. While holding the winding lever in the fully wound position, depress the trigger. The shutter blades should not open while the winding lever is being held down. If they do, refer to the Trouble Chart. (Both flash settings extremely fast; see page 5).

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

| | |
|---|---|
| F (short stroke)* | 3 1/2--5 1/2 milliseconds. |
| M (long stroke)* | 12--16 milliseconds. |

*From instant of contact until the shutter blades first begin to show light.

## FLASH SHUTTER CONTACT CONVERSION KIT

A more satisfactory operation of the shutter has been achieved by a change in the design of the flash contact parts. The old-style parts, which are to be discarded, are no longer available. They are to be replaced by the parts furnished in the Flash Shutter Contact Conversion Kit No.121352 — Supplement to Parts List No. 1-1490.

## OLD-STYLE FLASH CONTACT PARTS

The sequence of disassembly is as follows:

1. CONTACT WIRE BUSHING, figure 9, the contact WIRE, and the connector screw NUT.
2. CASE INSULATING BUSHING and the CONNECTOR SCREW.
3. CONTACT SPRING.
4. CONTACT BRACKET with contact point ASSEMBLY.
5. Contact insulating BLOCK.
6. Contact LEVER COMPLETE.
7. DETENT SPRING AND ROLLER SCREW, DETENT SPRING AND ROLLER WASHER, and DETENT SPRING AND ROLLER ASSEMBLY.
8. CONTACT ESCAPEMENT WHEEL.

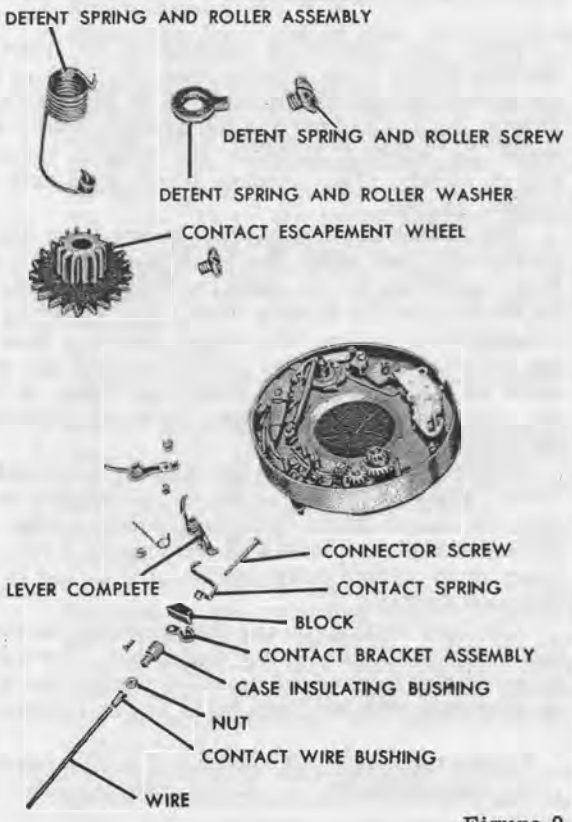


Figure 9

## NEW-STYLE FLASH CONTACT PARTS

The sequence of assembly is as follows:

1. Contact insulating block.
2. Place the contact LEVER LATCH SPRING, figure 8, on the contact LEVER BUSHING, with the long end of the spring at the bottom. Lift the long end of the spring and rest it against the outside edge of the spring lug on the contact lever latch. Form the short end of the spring around the vertical part of the contact lever tail. Then place the CONTACT LEVER SPRING on the contact lever bushing. Bend the last 1/8 inch of the long end of the contact lever spring clockwise, with respect to the bushing, at least 15 degrees.
3. Contact lever complete on the contact lever stud. The ends of the contact lever spring should face in, toward the shutter blades. Turn the long end of the spring in a clockwise direction to place it in tension, and rest it in the groove in the case. Form the short end of the spring around the vertical part of the contact lever tail.

   CAUTION: The contact lever tail is burnished and must remain in that condition.

4. Contact spring.
5. Case insulating bushing with the flat side facing the outer rim of the case.
6. Connector screw and connector screw nut.
7. Contact wire bushing and contact wire.
8. Cock and release the shutter and at the same time retard its opening action by placing one finger against the shutter SETTING LEVER, figure 12. Observe whether the BLADE CONTROLLER CONTACT STUD, figure 14, makes slight contact with the contact spring when the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.
9. STAR WHEEL ASSEMBLY, figure 4.
10. Replace the cover complete and the winding lever.
11. Cock the shutter; then press the trigger to release the shutter. At the same time hold the winding lever to prevent its return. The trigger latch must drop into the slot on the cover with a distinct snap. If it does not, check for a bind between the trigger and the trigger latch or between the trigger latch and the cover complete. If no bind exists, increase the tension on the trigger latch spring. A slight downward pressure on the trigger latch spring is desirable. There

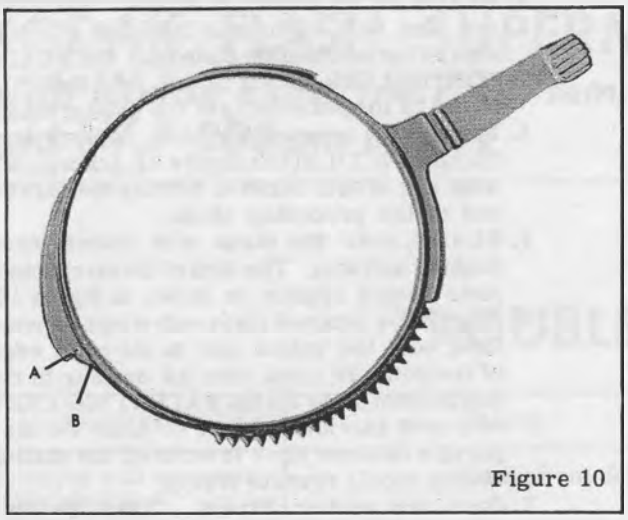

Figure 10

must be approximately .005-inch clearance between the contact lever tail and that portion of the trigger latch which engages the tail. The contact points must be in contact. If there is no clearance or if there is excessive clearance the spacing may be controlled by bending the contact lever tail in or out.

Allow the winding lever to go to the "at rest" position. Depress the trigger and watch to see that the flash contacts do not close. If they close, hold the end of the contact lever tail toward the shutter case, place a screwdriver blade against the vertical portion of the contact lever tail near the contact lever stud, and apply pressure toward the shutter blades at this point.

With the shutter tripped there must be approximately .005-inch clearance between the contact latch spring lug and the side of the contact lever. This is to assure full pressure of the contact lever latch into the star wheel.

While pressing the trigger down fully, watch the contacts to make sure that they do not close at any time. If they close, the contact lever tail on the contact lever has been bent too far and it should be moved back slightly. If necessary, the winding lever should be stoned at point "A", figure 10. Corner "B" must be square.

## SHUTTER BLADES

The sequence of disassembly is as follows:

1. Diaphragm control ring, paragraphs 1-4, page 7.
2. Speed control ring, paragraphs 2-4, page 7.
3. Winding lever, paragraph 3, page 7.
4. Cover complete, paragraphs 4-9, page 8.
5. Winding gear, clutch assembly, and star wheel assembly, paragraphs 5-7, page 8.
6. Trigger assembly and bulb lever assembly, paragraphs 5-7, page 9.
7. Retard gear train, paragraphs 5-16, page 9.
8. Main drive assembly, paragraphs 5-8, page 10.
9. Flash contact parts, paragraphs 5-9, page 11.
10. Rear lens mount.
11. Shutter operating disk bearing NUT, figure 11.
12. Shutter operating DISK and the shutter operating disk SPACER.
13. Blade controller LATCH SPRING BUSHING, figure 7, and the LATCH SPRING.
14. MECHANISM PLATE, figure 12.
15. Diaphragm retainer PLATE WITH WINGS ASSEMBLED, figure 13.
16. Shutter blades.
17. BLADE CONTROLLER.

The sequence of reassembly is as follows:

1. If necessary, clean the shutter blades thoroughly. Hold the blades carefully to avoid bending and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.
2. Blade controller.

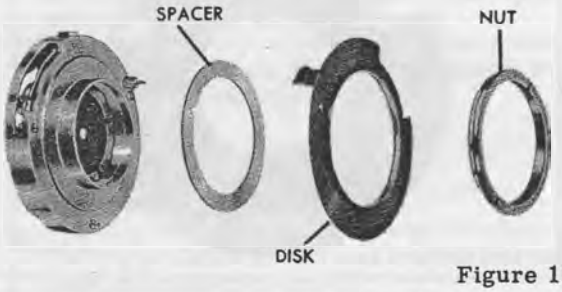

Figure 11

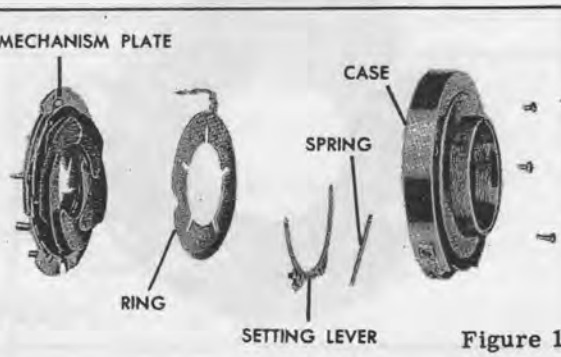

Figure 12

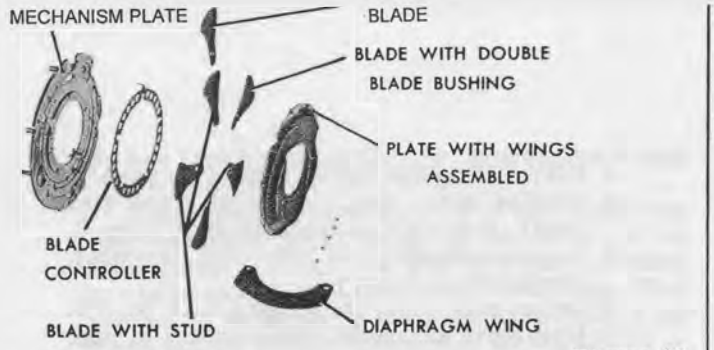


Figure 13

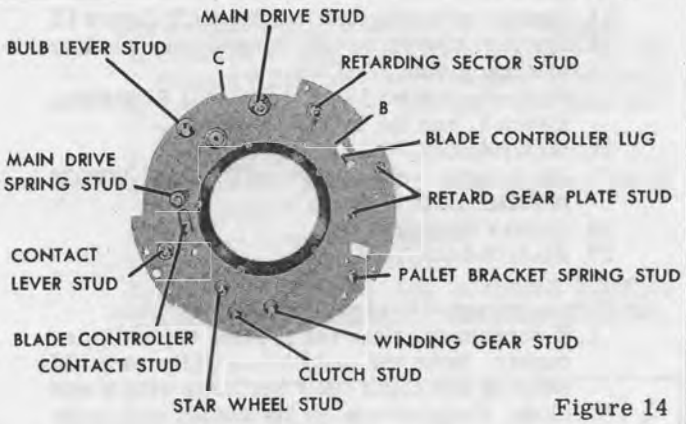


Figure 14

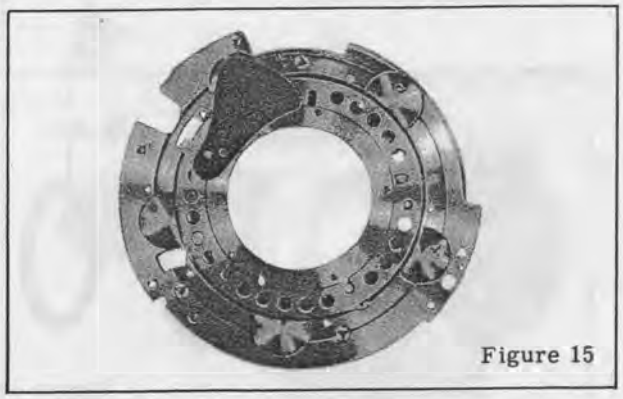

Figure 15

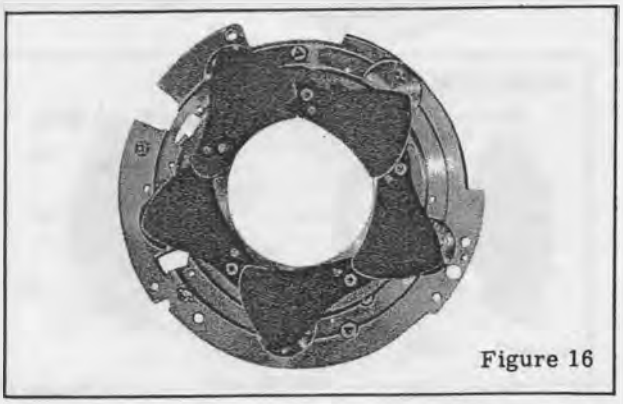

Figure 16

3. BLADE WITH DOUBLE BLADE BUSHING and stud, with the hole in the blade over the stud on the mechanism plate near the BLADE CONTROLLER LUG, figure 14. Refer to figure 15 for positioning of the shutter blade,
4. Proceeding counterclockwise, replace four BLADES WITH STUD, figure 13, allowing the wide end of each blade to overlap the narrow end of the preceding blade.
5. BLADE, over the blade with double blade bushing and stud. The back of the mechanism plate should appear as shown in figure 16.
6. Diaphragm retainer plate with wings assembled, with the cutout slot in the outer edge of the retainer plate over the opening in the mechanism plate for the PALLET BRACKET with stud assembly, figure 5. After the diaphragm retainer plate is secured, the shutter blades should operate freely.
7. Open the shutter blades. Close the diaphragm wings and run the side of a screwdriver blade around the central opening in the mechanism plate. This will open the diaphragm wings uniformly to the maximum aperture.
8. The shutter CASE, figure 12, diaphragm RING, and the SETTING LEVER with stop stud should be thoroughly cleaned. Apply a thin film of grease (Texaco Unitemp-RCX149 Grease) in the recess in the case occupied by the setting lever. Then wipe this area lightly with a clean cloth.
9. Diaphragm ring. Turn the ring until the projecting arm is near the cable release nut.
10. Setting lever with stop stud, with the setting lever SPRING extending through the opening in the case with the stop stud near the cable release nut.
11. Mechanism plate. See that the circular projections on the ends of the diaphragm wings are in position in the slots in the diaphragm ring. After the plate is secured, the diaphragm ring, the setting lever, and the shutter blades should operate freely. Secure the loose end of the setting lever spring.
12. Blade controller latch spring bushing and latch spring.
13. Shutter operating disk spacer and shutter operating disk.
14. Shutter operating disk bearing nut.
15. Flash contact parts, paragraphs 1-8, page 11.
16. Main drive assembly, paragraphs 1-4, page 10.
17. Retard gear train, paragraphs 1-13, pages 9 and 10.
18. Trigger assembly, and bulb lever assembly, paragraphs 1-6, page 9.
19. Winding gear, clutch assembly, and star wheel assembly, paragraphs 1-4, page 9.
20. Rear lens mount.

# KODAK FLASH SUPERMATIC SHUTTER

***With Kodak Ektar f/4.7 127mm, f/3.7 105mm, and f/7.7 203mm Lenses***

## TROUBLE CHART

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Solenoid will not work flash shutter | Shutter not designed for use with a solenoid. | |
| Synchronizer scale does not operate | Scale rivet pulled out. | Fit new rivet and readjust the scale. |
| Shutter does not trip easily | Possible burr on TRIGGER, figure 20. | Burnish the trigger at the point where it contacts the MAIN DRIVE ASSEMBLY, figure 7, when in a set position. |
| No Kodatron contact | BLADE CONTROLLER CONTACT STUD, figure 20, is not touching the CONTACT SPRING, figure 21. | Adjust the contact spring so that it touches the contact stud on the blade controller when the blades are almost fully opened. It is possible to make the adjustment after removing the front lens mount. There must be no contact when the blades are held open with the blade arrestor. |
| Shutter blades remain open on high speeds | Plate blade studs missing on mechanism plate.<br><br>Split shutter blades.<br><br>Loose studs on shutter blades. | Replace and restake the studs carefully to avoid swelling the top of the studs.<br><br>Replace the shutter blades.<br><br>Replace the shutter blades. |
| Shutter does not set | The TRIGGER LATCH, figure 20, is not returning to its proper position after the shutter has been released. | The trigger latch is bent and binding on the speed index plate or cover.<br><br>It may be necessary to reduce the tension on the TRIGGER LATCH SPRING, figure 19. |
| The winding lever does not hold when the shutter is set | The winding gear pinion is loose on the gear.<br><br>The CLUTCH ASSEMBLY, figure 4, is slipping.<br><br>The latch point on the contact LEVER COMPLETE, figure 21, is damaged. | Replace the pinion gear assembly.<br><br>Replace the clutch assembly.<br><br>Replace the contact lever complete. |
| Shutter speeds slow | Retard gears dirty.<br><br>The MAIN DRIVE SPRING, figure 7, is weak. | Remove and clean the retard gears.<br><br>Replace the main drive spring. |

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Shutter speeds slow (cont'd) | Shutter blades binding. | Remove and clean the shutter blades. If necessary, replace the blades. |
| | Excessive retard sector travel. | Swedge the speed control RING, figure 18, at the area controlling the slow speed (see figure 17). |
| | Blade controller binding. | Re-form the diaphragm retainer plate to allow more clearance between the plate and the mechanism plate. |
| | | Be sure the blade controller is flat. |
| Shutter speeds fast | Insufficient retard sector travel. | File the speed control ring at the area controlling the fast speed (see figure 17). |
| | Insufficient pallet engagement (on shutter speeds 1/10 second or slower). | Remove the material on the speed control ring in the area of contact with the pallet bracket stud. |
| | | Check for bind of the PALLET BRACKET, figure 6, against the retard gear PLATE COMPLETE. |
| | Gear train dirty. | Clean the gear train thoroughly. |
| | Too much tension on the main drive spring. | Replace the main drive spring. |
| Shutter blades buckle | NOTE: The following conditions may contribute to blade buckle singly or in combination. | |
| | Loose studs on shutter blades or MECHANISM PLATE, figure 23. | Replace the shutter blades. Restake the studs on the mechanism plate carefully to avoid swelling the top of the stud. |
| | BLADE CONTROLLER with contact stud, figure 13, not flat. | Straighten or replace the blade controller. |
| | Shutter blades not flat. | Replace the blades. |
| | Mechanism plate not flat. | Replace the mechanism plate. |
| | Blade controller too loose or too tight on the central hub of the mechanism plate. | Replace the blade controller. |
| | Too much play between mechanism plate and diaphragm retainer PLATE WITH WINGS ASSEMBLED, figure 13, due to retainer plate being bowed. | Replace the diaphragm retainer plate with wings assembled. |
| | Burr or roughness on diaphragm retainer plate with wings assembled. | Replace the plate. |

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Shutter blades buckle (cont'd) | Blades opening too far. | File and burnish the blade controller LATCH at point "A" (see figure 7). |
| | Blades closing too far. | Swedge the mechanism plate at point "B" (see figure 26). |
| | No clearance between the blade controller latch and the BLADE CONTROLLER LUG, figure 26, when the shutter is in the tripped position. | Swedge the mechanism plate at point "C", figure 26, such that this point acts as a stop for the SETTING LEVER with stop stud, figure 23. |
| Shutter operates instantaneously on B (bulb) | The lug on the side of the rectangular opening in the trigger is out of adjustment. | Bend the lug on the trigger in or out until proper adjustment is achieved. |
| Both flash settings are below the millisecond tolerances (fast) | The tension is too great on the WINDING GEAR SPRING, figure 4. | Relieve the tension slightly on the winding gear spring. However, there must be enough tension on the spring to permit the winding lever to carry through on both the F and M flash settings. |
| Both flash settings are above the millisecond tolerances (slow) | There is not enough tension on the winding gear spring. | Place the winding gear spring under slightly greater tension. Care should be taken during this adjustment not to disturb the trigger latch. |
| | The winding lever may be binding around the central opening of the cover or on the speed INDEX PLATE, figure 18. | Try lubricant or replace the WINDING LEVER, figure 18. |
| The F (short stroke) is within the millisecond tolerances but the M (long stroke) is fast | FLASH RETARD PALLET assembly, figure 19, not meshing properly with the winding lever. | With special Tool No. 657, turn the eccentric post so that the pallet will mesh more firmly in the teeth of the winding lever. Make certain the post is tight on the cover after making this adjustment. |
| | The flash retard pallet may be binding on the speed index plate. | The index plate will be marked at the binding point. File the plate at this point to allow clearance for the pallet. |
| Constant flash short | The contact spring may be bent and touching either the contact lever or the cover. | Re-form the contact spring. |
| Both flash settings are extremely fast | The trigger latch may not be falling into the slot on the cover. This allows the shutter blades to open too soon. | Add more tension to the trigger latch spring. |
| | The end of the trigger latch is bent back, toward the trigger. When the latch falls into the slot on the cover, the bent latch will permit the trigger to go down far enough to trip the shutter blades. | Re-form the end of the trigger latch by bending it slightly towards the winding gear.<br>After the shutter has been assembled, it can be checked to see if the shutter blades will open before the winding lever opens them.<br>1. Set the shutter. |

| TROUBLE | CAUSE | REMEDY |
|---|---|---|
| Both flash settings are extremely fast (cont'd) | | 2. Set the winding lever.<br>3. Holding the winding lever down, release the shutter. The shutter blades should not open while the winding lever is down. |
| Shutter will not flash lamps when all-metal flasholder is in contact with camera, but will, when flasholder is held away from camera | Breakdown in the insulation of ground strap. | There should be a resistance of 10,000 ohms between the connector pin nearest the blade arrestor button and any other spot on the shutter case. If not, replace the ground strap, together with the resistor. |

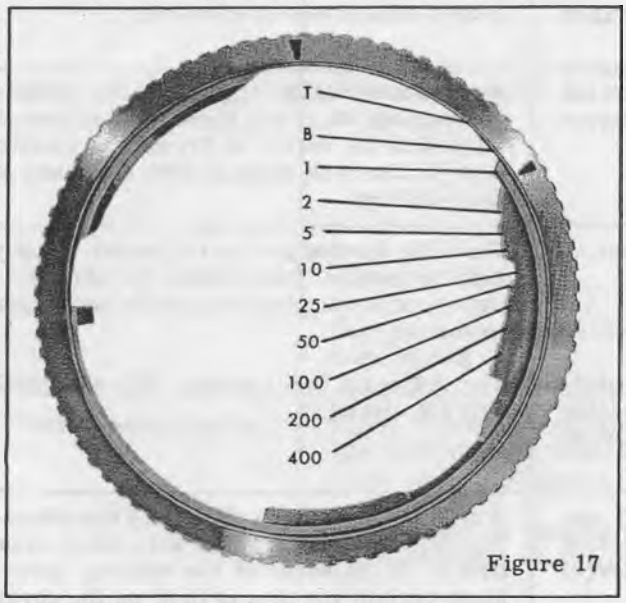

Figure 17

# DISASSEMBLY AND REASSEMBLY

SPEED CONTROL RING

The sequence of disassembly is as follows:

1. Front lens mount, using Tool No. 501-0.
2. Diaphragm pointer TIP, figure 18.
3. Set the synchronizer scale at "M."
4. Speed and diaphragm INDEX PLATE, by turning the plate counterclockwise until the three projections in the center of the plate fit into the three cutouts on the outside edge of the central collar.
5. Speed control RING.

CAUTION: If the WINDING LEVER is disturbed, the flash timing will have to be adjusted.

The sequence of reassembly is as follows:

1. Speed control ring, with shutter in tripped position. Be sure the projecting lug on the BULB LEVER ASSEMBLY, figure 20, the studs on the retarding SECTOR WITH STUD, figure 6, and the PALLET BRACKET with stud assembly are resting against the inside edge of the speed control ring and are not underneath the ring.
2. Speed and diaphragm index plate, by lining up the three projections in the center of the plate with the three cutouts on the outside edge of the central collar. Turn the plate clockwise until it is properly positioned.
3. Diaphragm pointer tip.
4. Front lens mount.

WINDING LEVER

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5 above.
2. WINDING LEVER, figure 18.

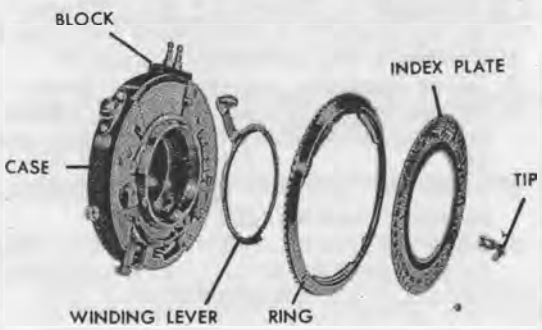


Figure 18

The sequence of reassembly is as follows:

1. Apply a thin film of grease (Texaco Unitemp-RCX169 Grease) to the teeth of the winding lever.
2. Set the shutter.
3. Winding lever, with the sixth or seventh tooth from the left meshed with the WINDING GEAR, figure 4. Place the WINDING GEAR SPRING in tension by giving two and one-quarter strokes to the winding lever, lifting and replacing the lever after the first and second strokes. This should be the approximate setting for the flash synchronization of the shutter.

CAUTION: Do not touch the TRIGGER LATCH, figure 20, as it may release the winding gear spring tension.

Trip the shutter and lightly hold the winding lever down around the central collar on the cover. As the shutter is tripped, the end of the latch should fall into the slot on the cover. If it does not, add more tension on the TRIGGER LATCH SPRING, figure 19. Check for a bind between the trigger latch and the TRIGGER, figure 20, at the point of attachment. The winding lever should contact the trigger latch; push the latch out of the slot in the cover and open the shutter blades. After the shutter has been tripped, the latch should return to a position where it is resting on the ledge just above the small slot in the cover.

After the trigger is depressed, allow it to

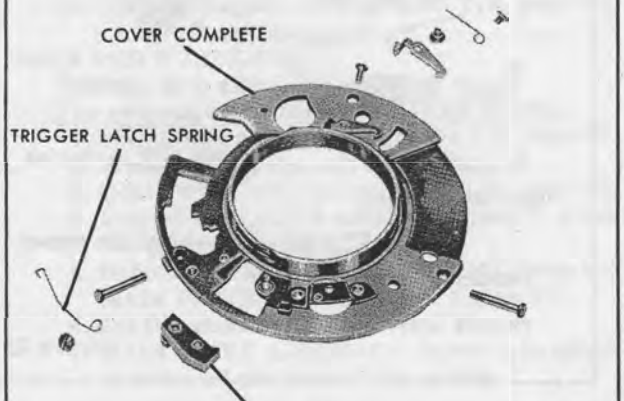


Figure 19

return to its proper position very slowly. If there is too much tension on the trigger latch spring, it will tend to retard the action of the latch and the trigger.

4. Speed control ring, paragraphs 1-4, page 19.

COVER COMPLETE

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. TRIGGER LATCH SPRING, figure 19.
4. Lift up the loose end of the TRIGGER LATCH, figure 20, sufficiently to clear the COVER COMPLETE, figure 19. Move the end of the latch until it is clear of the CASE, figure 18.
5. High speed spring CAM, figure 7, and the HIGH SPEED SPRING.
6. FLASH RETARD PALLET assembly, figure 19.
7. COVER COMPLETE.

The sequence of reassembly is as follows:

1. Cover complete.
2. Set the shutter.
3. Trigger latch, with the long bent end of the latch contacting the inner edge of the contact LEVER COMPLETE, figure 21. Be sure the latch does not bind.
4. Trigger latch spring; do not fasten securely. Lift the loose end of the spring over the trigger latch until it is at a point half way between the latch and the central collar. Then secure the spring. Place the spring against the outside edge of the trigger latch. The latch should be burnished and a thin film of grease (Texaco Unitemp-RCX169 Grease) applied at the point of spring contact.

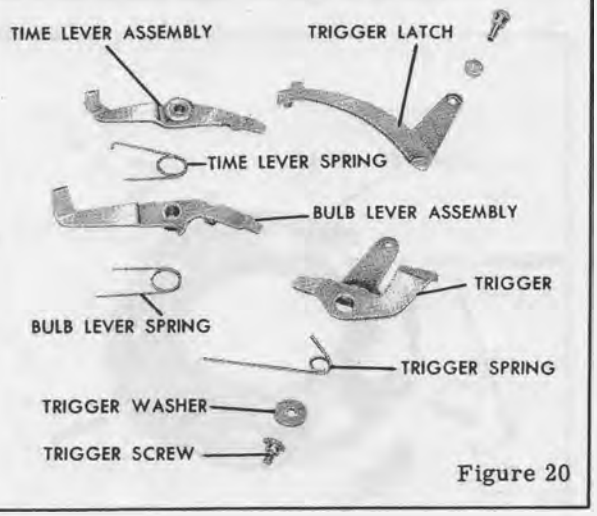

Figure 20

5. Winding lever, paragraphs 1-3, page 19.
6. Flash retard pallet assembly on the eccentric stud.

   Pull down the winding lever slowly and see that the pallet falls into every tooth of the lever. If it does not, turn the eccentric stud until the pallet is closer to the lever, using Tool No. 657. Care should be taken not to get the pallet too close to the lever, as this will cause the action of the lever to be rough.

   NOTE: Be sure the eccentric stud is tight on the cover. If any adjustment is made to the stud, it should be anchored securely in position on the cover complete.

7. High speed spring and the high speed spring cam.
8. Winding lever, paragraph 4, page 19.

WINDING GEAR, CLUTCH ASSEMBLY, AND STAR WHEEL ASSEMBLY

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7 above.
4. WINDING GEAR, figure 4, and the WINDING GEAR SPRING.
5. CLUTCH ASSEMBLY.
6. STAR WHEEL ASSEMBLY.

The sequence of reassembly is as follows:

1. Winding gear and the winding gear spring on the WINDING GEAR STUD, figure 26.
2. Star wheel assembly.
3. Clutch assembly, with a thin film of grease (Texaco Unitemp-RCX169 Grease) on the underside of the assembly. The top gear of the clutch assembly should turn freely only in a clockwise direction when the lower gear of the clutch assembly is held tight.
4. Cover complete, paragraphs 1-8 above.

TRIGGER, TIME LEVER ASSEMBLY, AND BULB LEVER ASSEMBLY

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7 above.
4. Unhook the MAIN DRIVE SPRING, figure 7, from the MAIN DRIVE SPRING STUD, figure 26.
5. TRIGGER SCREW, figure 20, TRIGGER SPRING, and TRIGGER WASHER.
6. TRIGGER, TIME LEVER ASSEMBLY, TIME LEVER SPRING, BULB LEVER ASSEMBLY, and BULB LEVER SPRING.

The sequence of reassembly is as follows:

1. With the bulb lever spring underneath, hold the trigger with the oval hole up and insert the bulb lever assembly in the opening on the trigger. Place the time lever assembly and the time lever spring between the top of the trigger and the top of the bulb lever assembly with the spring facing up. Grasp the three parts by inserting one prong of a pair of tweezers down through the center of the holes. With the longer ends of the time and bulb lever springs turned in a clockwise direction and the shorter ends resting against the lugs on the levers, guide the parts down over the TIME AND BULB LEVER STUD, figure 26. The long ends of the springs should rest against the case.
2. Trigger washer, trigger spring, and trigger screw. Lift the long end of the spring over the end of the MAIN DRIVE SPRING STUD, and rest it against the stud.
3. Hook the loose end of the main drive spring onto the main drive spring stud.
4. Cover complete, paragraphs 1-8, page 20.

RETARD GEAR TRAIN

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7, page 20.
4. Retard GEAR PLATE SCREW, figure 6, near the retarding SECTOR WITH STUD.
5. Retard gear plate ANTI-BACKLASH SPRING.
6. Unhook the retard PALLET BRACKET SPRING. Remove the remaining retard gear plate screw.
7. Retard gear PLATE COMPLETE.
8. Retard GEAR WITH NO. 2 PINION assembly.
9. Retard GEAR WITH NO. 3 PINION assembly.
10. ESCAPEMENT WHEEL with No. 4 pinion assembly.
11. Retard PALLET.
12. PALLET BRACKET with stud assembly and pallet bracket spring.

    NOTE: If the retard gears are dirty, clean the retard gear bearing holes in the mechanism plate and all the parts of the gear train thoroughly.

13. Retarding SECTOR SCREW. Unhook the retarding SECTOR SPRING.
14. Set the shutter.
15. Retarding sector with stud and the retarding sector spring.

The sequence of reassembly is as follows:

1. Retarding sector with stud and the retarding sector spring, with the long end of the spring at the top.
2. Retarding sector screw.
3. Place the long end of the spring against the inner side of the blade controller LATCH SPRING BUSHING, figure 7.
4. With the short end of the pallet bracket spring down, place the spring inside the pallet bracket with stud assembly. Allow the long end of the spring to extend out toward the case. Place the pallet bracket and the pallet bracket spring on the PALLET BRACKET SPRING STUD, figure 26. The long end of the spring should rest against the inside of the case.
5. Retard pallet.
6. Escapement wheel with No. 4 pinion assembly.
7. Retard gear with No. 3 pinion assembly.
8. Retard gear with No. 2 pinion assembly.
9. Retard gear plate complete, with the teeth of the gear facing the shutter blades.
10. Retard gear plate screw near the pallet bracket.
11. Lift up the gear end of the gear plate until the teeth of the retarding sector with stud pass freely under the gear. Place the retarding sector so that when the gear teeth are meshed the outer edge of the sector will be approximately 1/8 inch from the shutter case.
12. Retard gear plate anti-backlash spring on the RETARD GEAR PLATE STUD, figure 26. Line up the opening in the spring with the hole in the gear plate. Replace, but do not tighten, the remaining gear plate screw. The spring should be parallel to the shutter case. Holding the spring in this position, tighten the gear plate screw. Hook the end of the anti-backlash spring onto the retard plate gear LUG, figure 6.
13. Put the pallet bracket spring in tension by placing the long end of the spring against the inside edge of the lug on the retard gear plate complete.
14. Cover complete, paragraphs 1-8, page 20.

MAIN DRIVE ASSEMBLY

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7, page 20.
4. Unhook the LATCH SPRING, figure 7, from the main drive LATCH.
5. Unhook the MAIN DRIVE SPRING from the MAIN DRIVE SPRING STUD, figure 26.
6. Set the shutter.
7. MAIN DRIVE ASSEMBLY, figure 7, to which is attached the main drive spring.

The sequence of reassembly is as follows:

1. Apply a thin film of grease (Texaco Unitemp-RCX169 Grease) in the slot on the main drive assembly where it engages the stop stud on the SETTING LEVER, figure 23; on the MAIN DRIVE STUD, figure 26; on the LATCH, figure 7, at the point of contact with the LATCH SPRING, and on the latch where it contacts the RETARDING SECTOR STUD, figure 26. This area of the latch should be burnished before applying the lubricant.
2. Main drive assembly on the main drive stud, being sure to fit the setting lever stop stud into the assembly.
3. Close the shutter blades. Push the latch toward the BLADE CONTROLLER LUG, figure 26. The cutout part of the latch will come to rest around the lug. Place the loose end of the latch spring against the vertical lug on the tip of the latch.
4. Main drive spring.
5. Cover complete, paragraphs 1-8, page 20.

FLASH CONTACT PARTS

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7, page 20.
4. CONNECTOR PINS, figure 21, using Tool No. 635.
5. Connector BLOCK, figure 18, by removing the two connector block screws.
6. Disengage the RESISTOR from the mechanism plate.
7. CONTACT STRIP CONNECTOR SCREW.
8. Holding the CONTACT SCREW, figure 21, with Tool No. 262, remove the CONTACT SCREW NUT, using Tool No. 503L. Remove the contact screw.
9. CONTACT SPRING, to which is fastened the GROUND CONTACT STRIP and the resistor. Remove the case insulator WASHER and the case INSULATOR.
10. Contact LEVER COMPLETE.
11. Shutters of the flash receptacle type are disassembled as follows: Using Tool No. 503J, remove the TERMINAL NUT, figure 22, on the end of the PLUNGER ASSEMBLY. Remove the case INSULATOR WASHER, the plunger assembly, and the terminal body insulating SLEEVE. On the contact end of the CONTACT SPRING, remove the CONTACT SCREW NUT, using Tool No. 503L. Remove the CONTACT SCREW, the contact spring, the case INSULATOR WASHER, and the case INSULATOR. Then remove the contact LEVER COMPLETE.

The sequence of reassembly is as follows:

1. If a new contact lever is to be used, place the contact LEVER LATCH SPRING, figure 21, on the contact LEVER BUSHING, with the long end of the spring at the bottom. Lift the long end of the spring and rest it against the outside edge of the spring lug on the contact lever latch. Form the short end

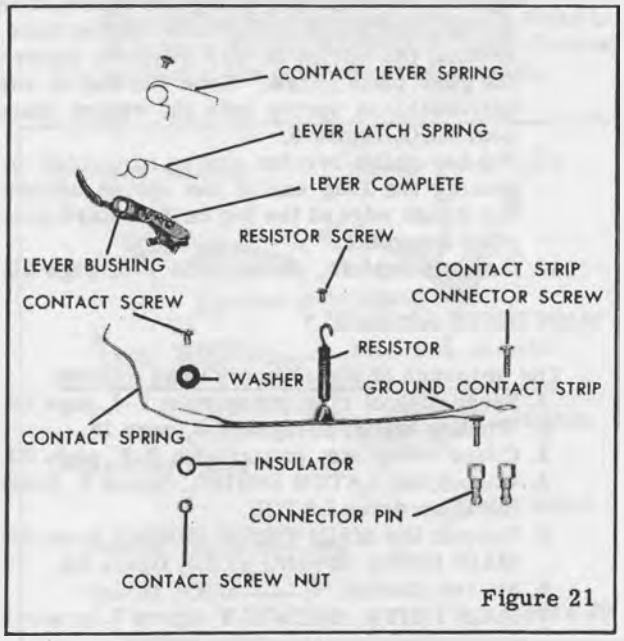

Figure 21

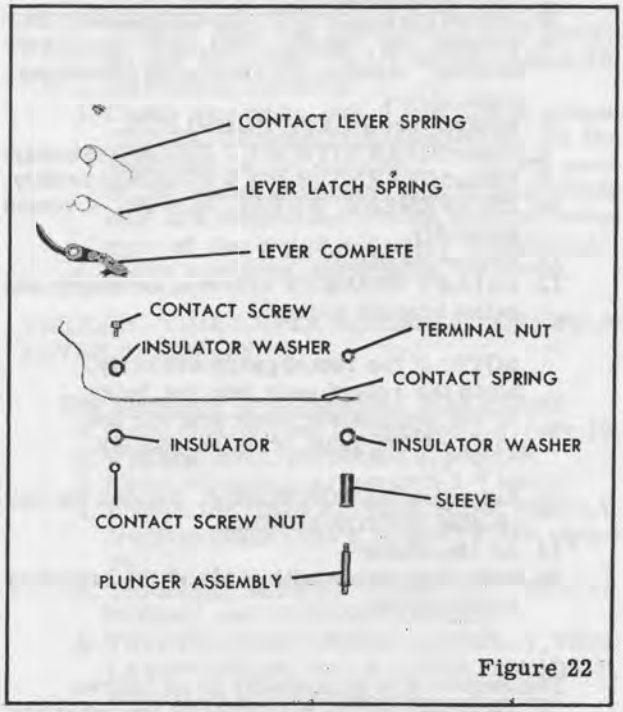

Figure 22

of the spring around the vertical part of the contact lever tail. Then place the CONTACT LEVER SPRING on the contact lever bushing. Bend the last 1/8 inch of the long end of the spring clockwise, with respect to the bushing, at least 15 degrees.

2. Contact lever complete on the CONTACT LEVER STUD, figure 26. The ends of the contact lever spring should face in, toward the shutter blades. Turn the long end of the spring in a clockwise direction to place it in tension, and rest it in the groove in the case. Form the short end of the spring around the vertical part of the contact lever tail.

   CAUTION: The contact lever tail is burnished and must remain in that condition.

3. Contact spring. Place the case insulator washer between the shutter case and the contact end of the contact spring and insert the contact screw. Secure the spring by replacing the case insulator and the contact screw nut. Tighten the nut by holding the contact screw with Tool No. 262, and turn the nut with Tool No. 503L.
4. Ground contact strip connector screw.
5. Connector block.
6. Connector pins.
7. Resistor.
8. If the shutter is of the flash receptacle plunger type, insert the threaded end of the plunger assembly in the collar end of the terminal body insulating sleeve. Then insert the assembled parts in the terminal body. Place the case insulator washer on the end of the plunger. Position the end of the contact spring over the opening in the shutter case and push the threaded end of the plunger through the opening in the spring. Fasten the plunger with the terminal nut.

   Insert the case insulator in the hole in the side of the shutter case, near the stud on the blade controller, with the collar end of the insulator facing out. Replace the case insulator washer over the opening on the inside of the shutter case. Position the contact end of the contact spring against the washer and insert the contact screw. Secure the screw with the contact screw nut, using Tool No. 503L, holding the screw with Tool No. 262.
9. Trip the shutter and at the same time retard its opening action by placing one finger against the shutter SETTING LEVER, figure 23. Observe whether the BLADE CONTROLLER CONTACT STUD, figure 26, makes slight contact with the contact spring just before the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.
10. Cover complete, paragraphs 1-8, page 20.

FLASH SYNCHRONIZATION

After the shutter is assembled, it must be checked to see if the winding lever will always

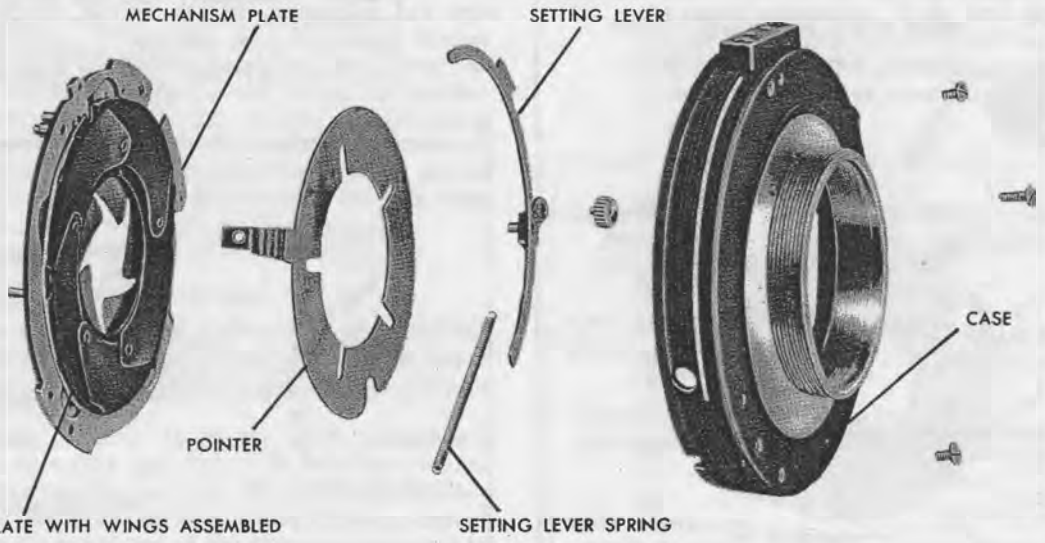


Figure 23

trip the shutter blades when the trigger is released very slowly. Set the shutter and the winding lever. Release the shutter allowing the winding lever to return slowly. The winding lever must trip the shutter blades.

The shutter must be checked to see if the shutter blades will open while the latch is still in the slot in the cover plate. To check for this condition, set the shutter and winding lever. While holding the winding lever in the fully wound position, depress the trigger. The shutter blades should not open while the winding lever is being held down. If they do, refer to the Trouble Chart. (Both flash settings extremely fast, see page 17.)

Check the operation of the winding lever safety latch. When the shutter is not set, the winding lever must be locked in the unwound position. After the shutter has been actuated with the winding lever, the winding lever must return fully and become locked in the unwound position.

The flash settings on the shutter should be timed with reliable shutter testing equipment. The tolerances of the delayed action in the shutter for synchronization with the flash bulbs are as follows:

| | | |
|---|---|---|
| F (short stroke)* | 3 1/2—5 1/2 | milliseconds |
| M (long stroke)* | 12—16 | milliseconds |

*From instant of contact until the shutter blades first begin to show light.

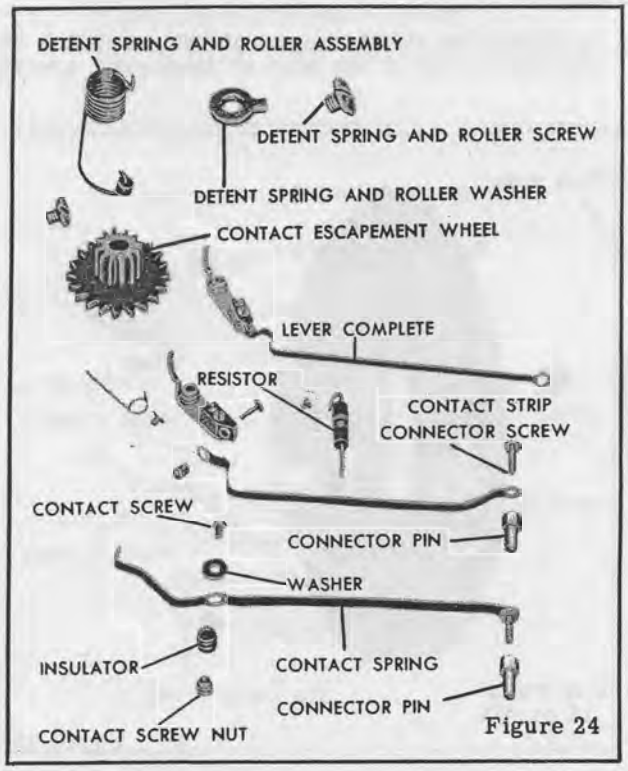

Figure 24

## FLASH SHUTTER CONTACT CONVERSION KIT

A more satisfactory operation of the shutter has been achieved by a change in the design of the flash contact parts. The old-style parts, which are to be discarded, are no longer available. They are to be replaced by the parts furnished in the Flash Shutter Contact Conversion Kit No. 121351 — Supplement to Parts List No. 1-1490.

## OLD-STYLE FLASH CONTACT PARTS

The sequence of disassembly is as follows:

1. CONNECTOR PINS, figure 24, using Tool No. 635.
2. Connector BLOCK, figure 18.
3. Disengage the RESISTOR from the mechanism plate.
4. Contact LEVER COMPLETE.
5. Ground CONTACT STRIP CONNECTOR SCREW.
6. Holding the CONTACT SCREW, figure 24, with Tool No. 262, remove the CONTACT SCREW NUT, using Tool No. 503L. Remove the contact screw, the case insulator WASHER and the CONTACT SPRING. Remove the resistor from the contact lever complete.
7. DETENT SPRING AND ROLLER SCREW, DETENT SPRING AND ROLLER WASHER and DETENT SPRING AND ROLLER ASSEMBLY.
8. CONTACT ESCAPEMENT WHEEL.
9. Shutters of the flash receptacle type are disassembled as follows: Using Tool No. 503J, remove the TERMINAL NUT, figure 25, on the end of the PLUNGER ASSEMBLY. Remove the case INSULATOR WASHER, the plunger assembly, and the terminal body insulating SLEEVE. On the contact end of the CONTACT SPRING, remove the CONTACT SCREW NUT, using Tool No. 503L.

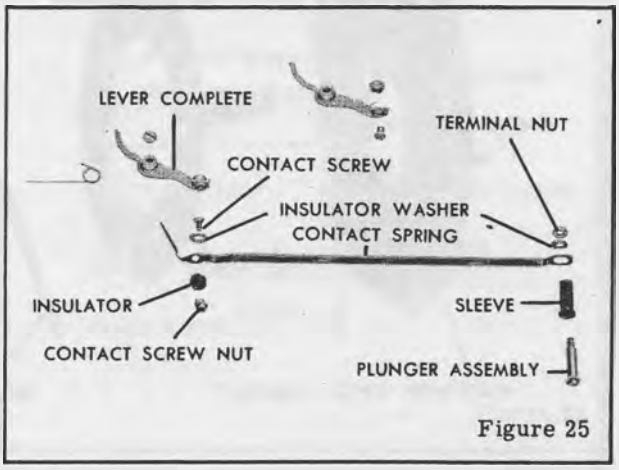

Figure 25

Remove the CONTACT SCREW, the contact spring, the case INSULATOR WASHER, and the case INSULATOR. Remove the contact LEVER COMPLETE.

NEW-STYLE FLASH CONTACT PARTS

The sequence of assembly is as follows:

1. Place the contact LEVER LATCH SPRING, figure 21, on the contact LEVER BUSHING, with the long end of the spring at the bottom and facing the shutter blades. Lift the long end of the spring and rest it against the outside edge of the spring lug on the contact lever latch. Form the short end of the spring around the vertical part of the contact lever tail. Then place the CONTACT LEVER SPRING on the contact lever bushing. Bend the last 1/8 inch of the long end of the spring clockwise, with respect to the bushing, at least 15 degrees.
2. Contact lever complete on the CONTACT LEVER STUD, figure 26. The ends of the contact lever spring should face in, toward the shutter blades. Turn the long end of the spring in a clockwise direction to place it in tension, and rest it in the groove in the case. Form the short end of the spring around the vertical part of the contact lever tail.

   CAUTION: The contact lever tail is burnished and must remain in that condition. If the contact lever touches the bulb lever assembly, approximately .010 inch should be removed from the end of the lever.

3. Contact spring of the connector pin type shutter. Place the case insulator washer between the shutter case and the contact end of the contact spring and insert the contact screw. Secure the spring by replacing the case insulator and the contact screw nut. Tighten the nut by holding the contact screw with Tool No. 262, and turn the nut with Tool No. 503L.
4. Ground contact strip connector screw.
5. Connector block.
6. Connector pins.
7. Secure the looped wire end of the resistor to the mechanism plate. Solder the other end of the resistor to the ground contact strip.
8. If the shutter is of the flash receptacle plunger type, see figure 22. Fit the contact lever spring and the contact lever as described in paragraphs 1 and 2 above. Insert the threaded end of the plunger assembly in the collar end of the terminal body insulating sleeve. Then insert the assembled parts in the terminal body. Place the case insulator washer on the end of the plunger assembly. Position the end of the contact spring over the opening in the shutter case and push the threaded end of the plunger assembly through the opening in the spring. Fasten the plunger with the terminal nut.

   Insert the case insulator in the hole in the inside of the case, near the stud on the blade controller, with the collar end of the insulator facing out. Replace the case insulator washer over the opening in the outside of the shutter case. Position the contact end of the contact spring against the washer and insert the contact screw in the opening in the spring. Fasten the screw with the contact screw nut, using Tool No. 503L, while holding the screw with Tool No. 262.
9. Trip the shutter and at the same time retard its opening action by placing one finger against the shutter SETTING LEVER, figure 23. Observe whether the BLADE CONTROLLER CONTACT STUD, figure 26, makes slight contact with the contact spring just before the blades are fully open. If the spring does not touch the stud, bend the end of the spring toward the stud.
10. STAR WHEEL ASSEMBLY, figure 4.
11. Replace the cover complete and the winding lever.
12. Cock the shutter; then press the trigger to release the shutter. At the same time hold the winding lever to prevent its return. The trigger latch must drop into the slot on the cover with a distinct snap. If it does not, check for a bind between the trigger and the trigger latch or between the trigger latch and the cover complete. If no bind exists, increase the tension on the trigger latch spring. A slight downward pressure on the spring is desirable. There must be approximately

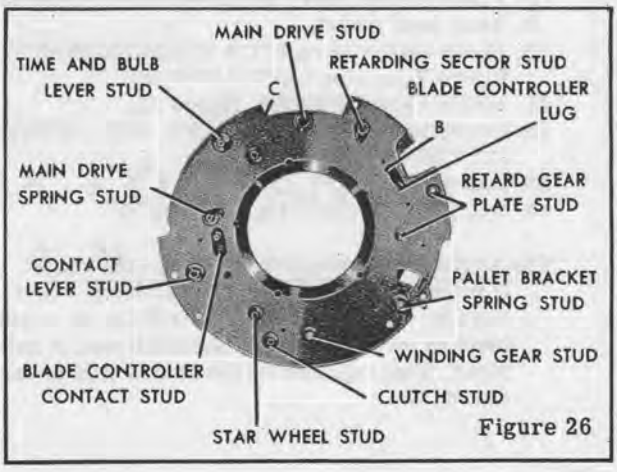

Figure 26

.005 inch clearance between the contact lever tail and that part of the trigger latch which engages the tail. The contact points must be in contact. If there is no clearance or if there is excessive clearance, the spacing may be controlled by bending the contact lever tail in or out.

Allow the winding lever to go to the "at rest" position. Depress the trigger and watch to see that the flash contacts do not close. If they close, hold the end of the contact lever tail toward the shutter case, place a screwdriver blade against the vertical position of the contact lever tail near the contact lever stud, and apply pressure toward the shutter blades at this point.

With the shutter tripped, there must be approximately .005 inch clearance between the contact lever latch spring lug and the side of the contact lever. This is to assure full pressure of the latch into the star wheel.

While pressing the trigger down fully, watch the contacts to make sure they do not close at any time. If they close, the contact lever tail on the contact lever has been bent too far and it should be moved back slightly. If necessary, the winding lever should be stoned at point "A " figure 10. Corner "B" must be square.

SHUTTER BLADES

The sequence of disassembly is as follows:

1. Speed control ring, paragraphs 1-5, page 19.
2. Winding lever, paragraph 2, page 19.
3. Cover complete, paragraphs 3-7, page 20.
4. Winding gear, clutch assembly, and star wheel assembly, paragraphs 4-6, page 20.
5. Trigger assembly, time lever assembly, and bulb lever assembly, paragraphs 4-6, page 20.
6. Retard gear train, paragraphs 4-5, page 21.
7. Main drive assembly, paragraphs 4-7, page 21.
8. Flash contact parts, paragraphs 4-11, page 22.
9. Rear lens mount.
10. Blade controller LATCH SPRING BUSHING, figure 7, and the LATCH SPRING.
11. MECHANISM PLATE, figure 23.
12. Diaphragm retainer PLATE WITH WINGS ASSEMBLED.
13. Shutter blades.
14. BLADE CONTROLLER, figure 13.

The sequence of reassembly is as follows:

1. If necessary, clean the shutter blades thoroughly. Hold the blades carefully to avoid bending and clean their surfaces with a soft cloth. Fingerprints on the blades will cause corrosion.
2. Blade controller.
3. BLADE WITH DOUBLE BLADE BUSHING and stud, figure 13, with the hole in the blade over the stud on the mechanism plate, near the BLADE CONTROLLER LUG, figure 26. Refer to figure 15 for positioning of the shutter blade.
4. Proceeding counterclockwise, replace four BLADES WITH STUD, figure 13, allowing the wide end of each blade to overlap the narrow end of the preceding blade.
5. BLADE, over the blade with double blade bushing and stud. The back of the mechanism plate should appear as shown in figure 16.
6. Diaphragm retainer plate with wings assembled, with the cutout slot in the outer edge of the retainer plate over the opening in the mechanism for the PALLET BRACKET with stud assembly, figure 6. After the retainer plate is secured, the shutter blades should operate freely.
7. Open the shutter blades. Close the diaphragm wings and run the side of a screwdriver blade around the central opening in the mechanism plate. This will open the diaphragm wings uniformly to the maximum aperture.
8. The shutter CASE, figure 23, diaphragm POINTER and the SETTING LEVER should be thoroughly cleaned. Apply a thin film of grease (Texaco Unitemp-RCX169 Grease) in the recess in the case occupied by the setting lever. Then wipe this area lightly with a clean cloth.
9. Diaphragm pointer. Turn the pointer until the projecting arm is near the cable release nut.
10. Setting lever, with one end of the SETTING LEVER SPRING attached to the lever and the loose end of the spring resting against the side of the shutter case.
11. Mechanism plate. See that the circular projections on the ends of the diaphragm wings are in position in the slots in the pointer. After the plate is secured, the diaphragm ring, the setting lever, and the shutter blades should operate freely. Secure the loose end of the setting lever spring to the case stud.
12. Blade controller latch and latch spring.
13. Flash contact parts, paragraphs 1-9, page 22.
14. Main drive assembly, paragraphs 1-4, page 22.
15. Retard gear train, paragraphs 1-13, page 21.
16. Trigger assembly, time lever assembly and bulb lever assembly, paragraphs 1-3, page 21.
17. Winding gear, clutch assembly, and star wheel assembly, paragraphs 1-4, page 20.
18. Rear lens mount.

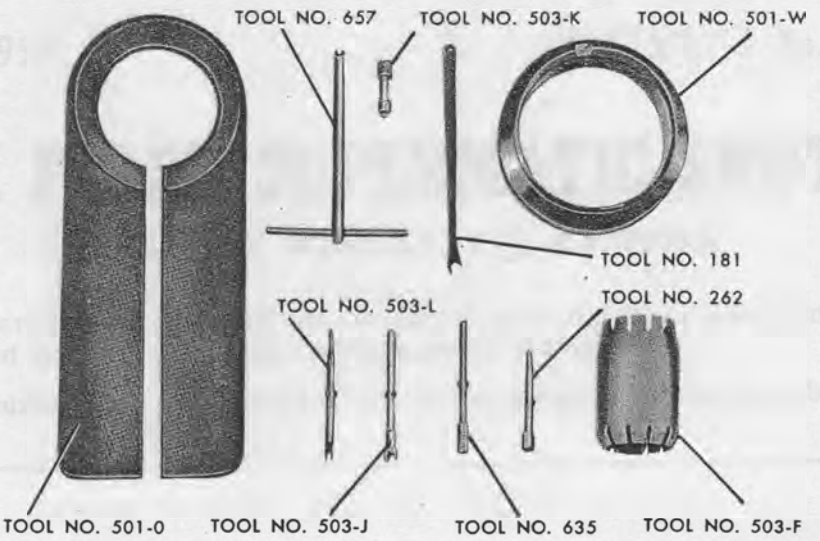

Figure 27

# EASTMAN KODAK COMPANY
## ROCHESTER 4, N. Y.

12-49-GLP-B

Lithographed in the United States of America

# Kodak

NOVEMBER 1950 PARTS LIST No. 1-1490D

# KODAK FLASH SUPERMATIC SHUTTER

## FOR KODAK MEDALIST II CAMERA

This parts list supersedes the section of parts list No. 1-1490 which covered the shutter for the Kodak Medalist II Camera.

The illustrations and parts list are in the sequence of disassembly.

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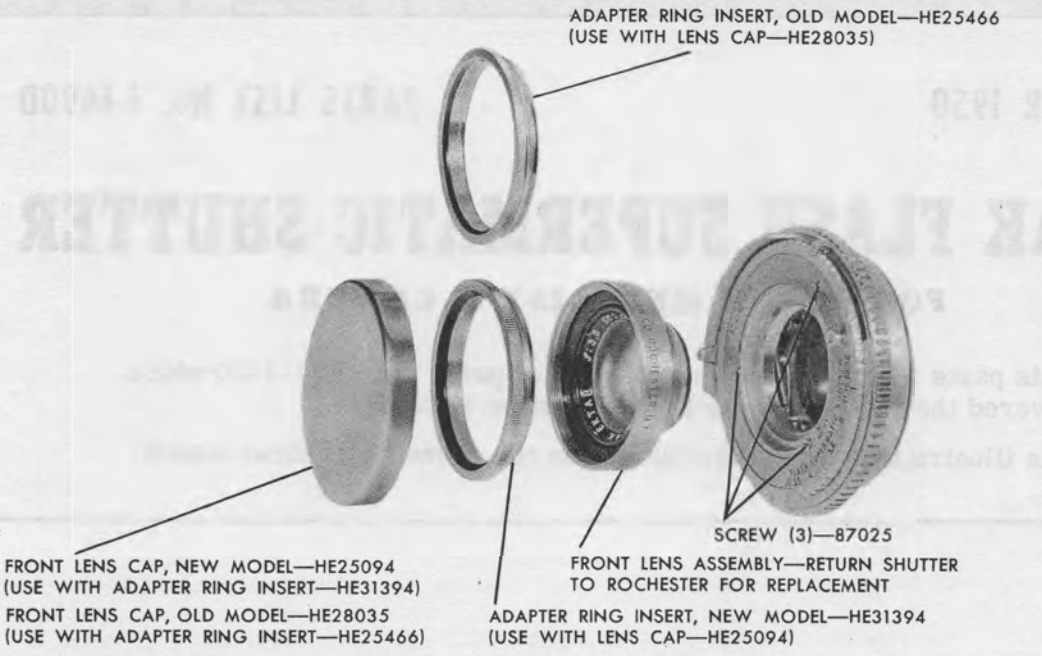
ADAPTER RING INSERT, OLD MODEL—HE25466
(USE WITH LENS CAP—HE28035)
FRONT LENS CAP, NEW MODEL—HE25094
(USE WITH ADAPTER RING INSERT—HE31394)
FRONT LENS CAP, OLD MODEL—HE28035
(USE WITH ADAPTER RING INSERT—HE25466)
ADAPTER RING INSERT, NEW MODEL—HE31394
(USE WITH LENS CAP—HE25094)
FRONT LENS ASSEMBLY—RETURN SHUTTER
TO ROCHESTER FOR REPLACEMENT
SCREW (3)—87025

Figure 1

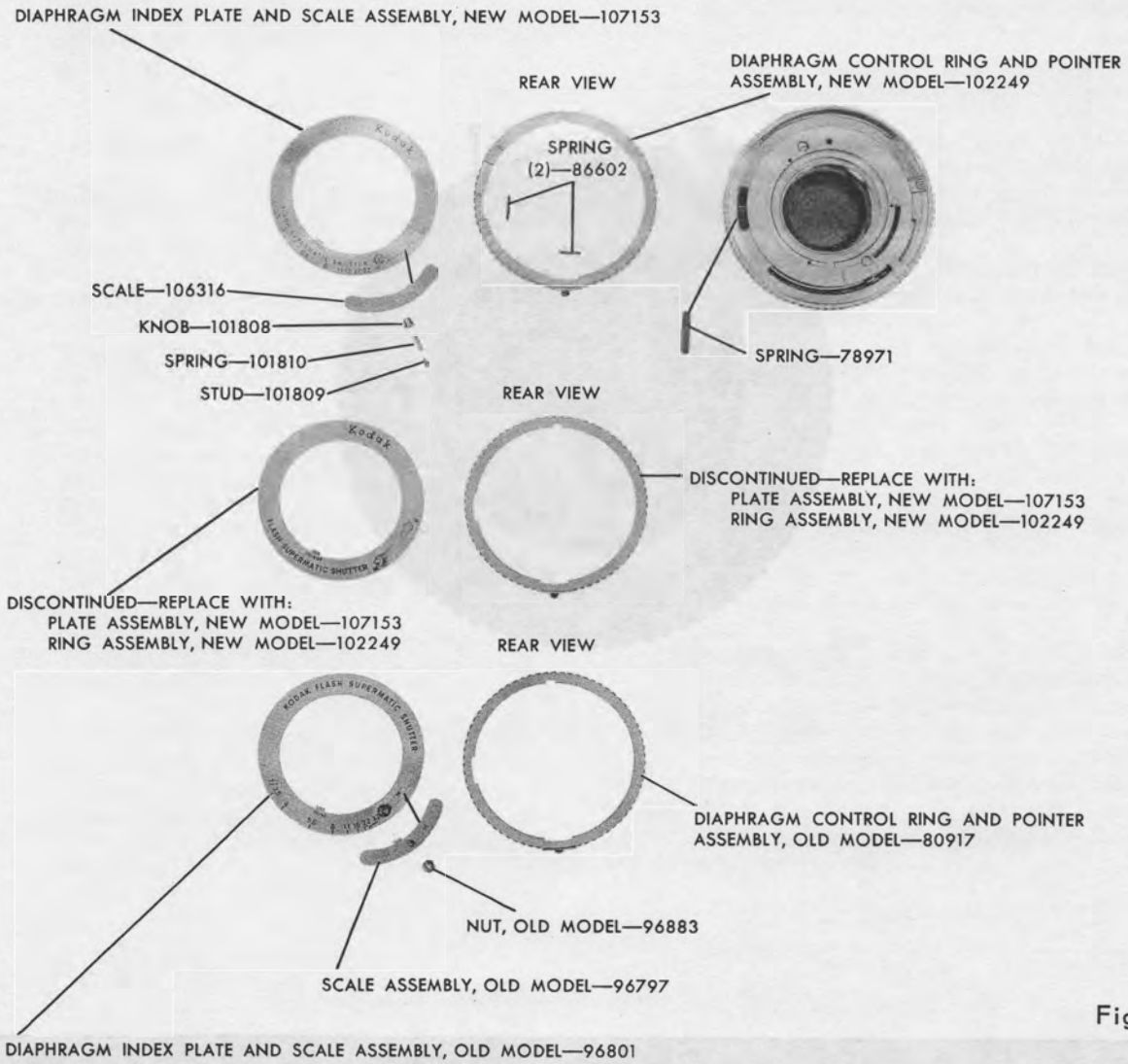


Figure 2



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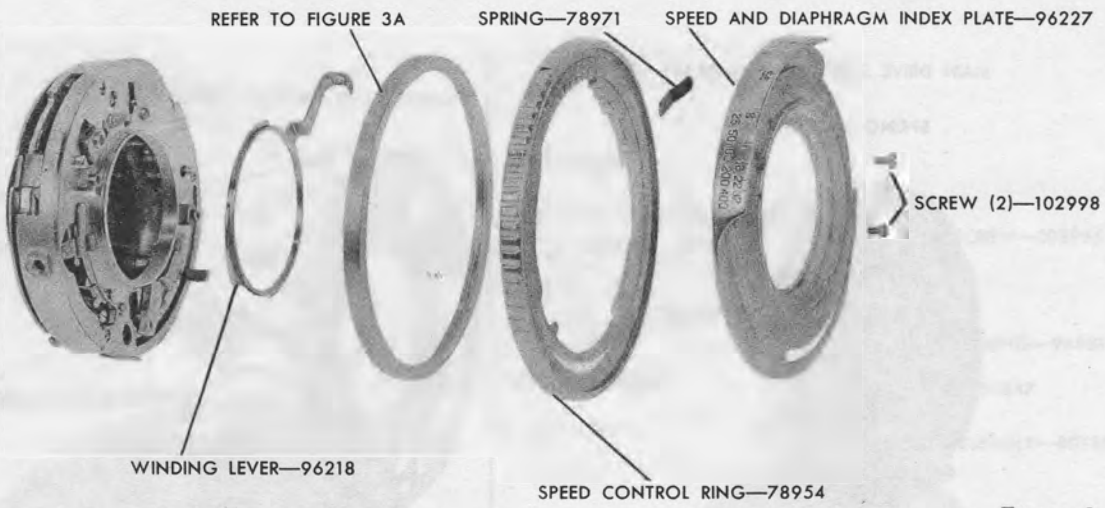



Figure 3

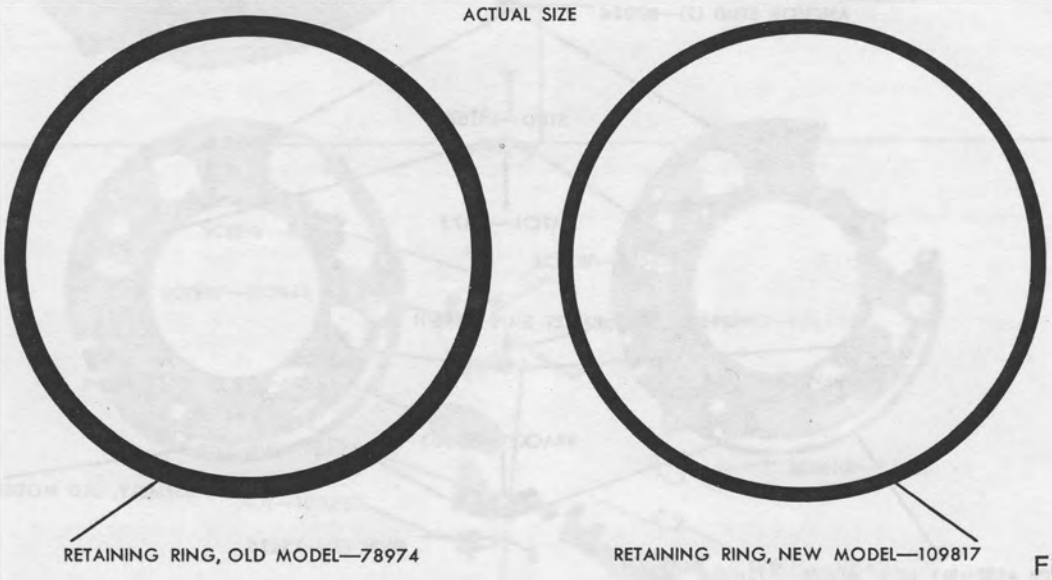



Figure 3A

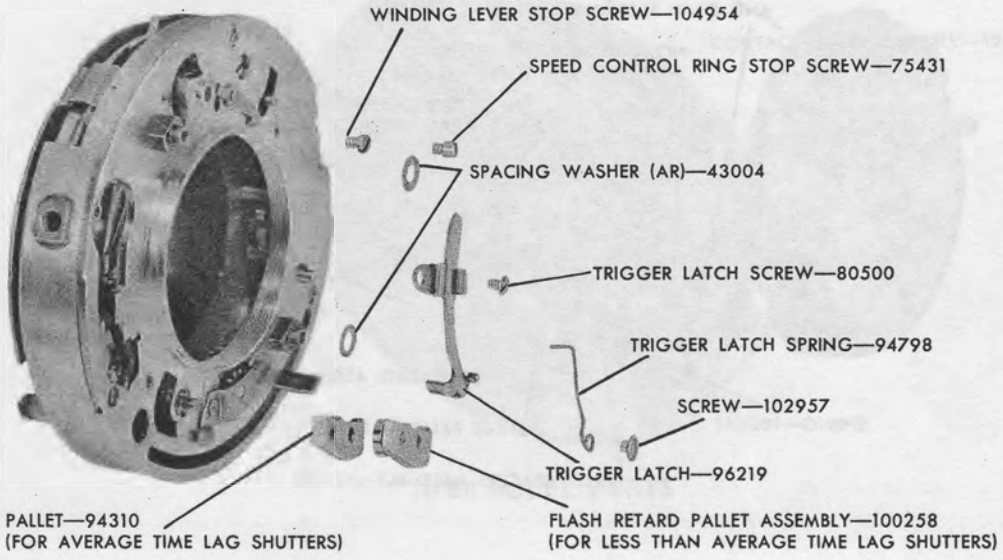



Figure 4

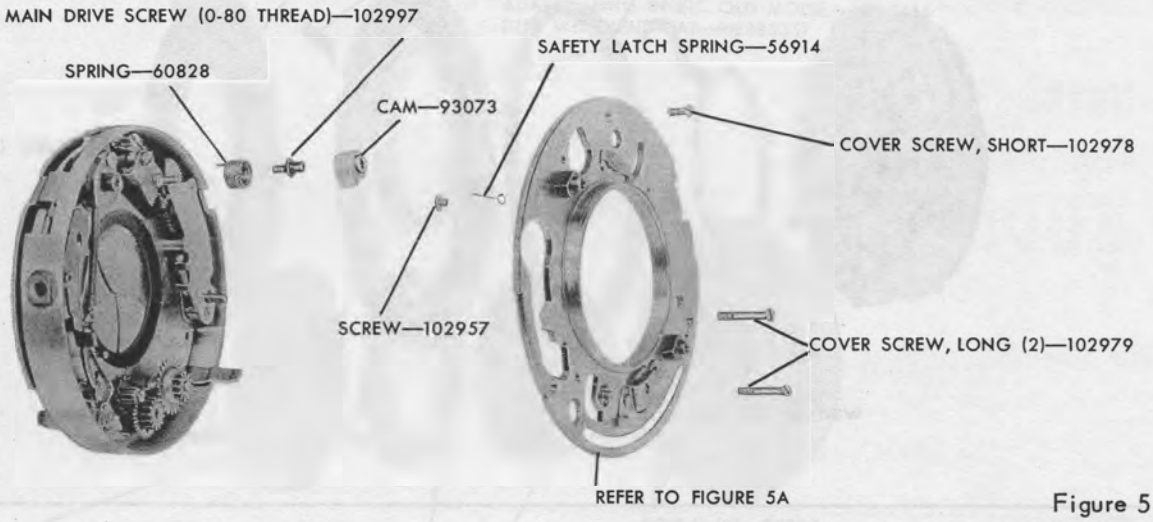



Figure 5

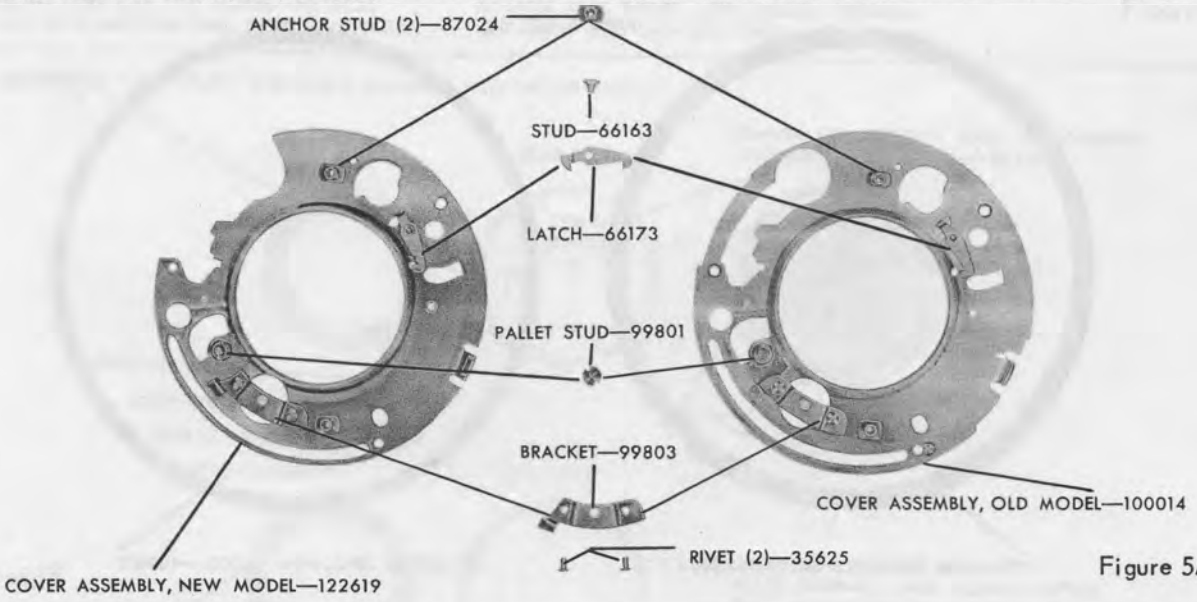



Figure 5A

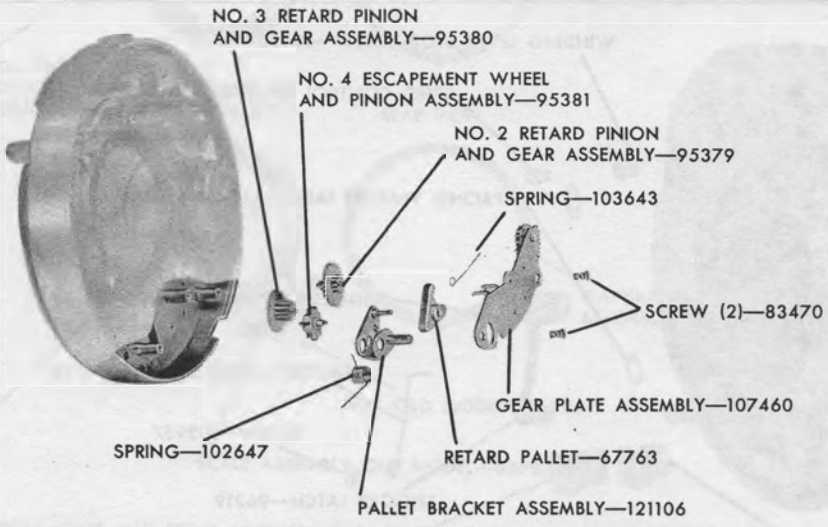



Figure 6

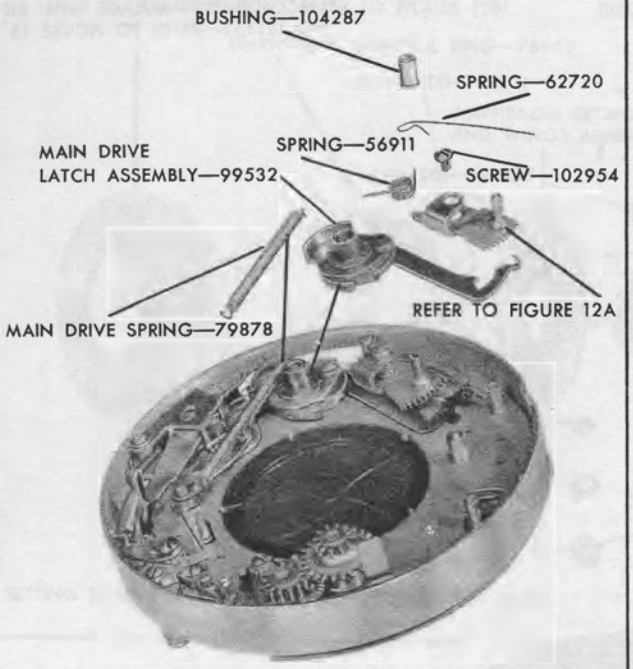



Figure 7

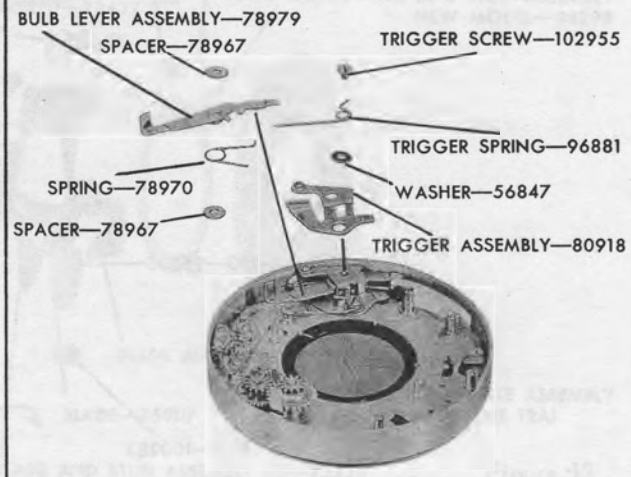
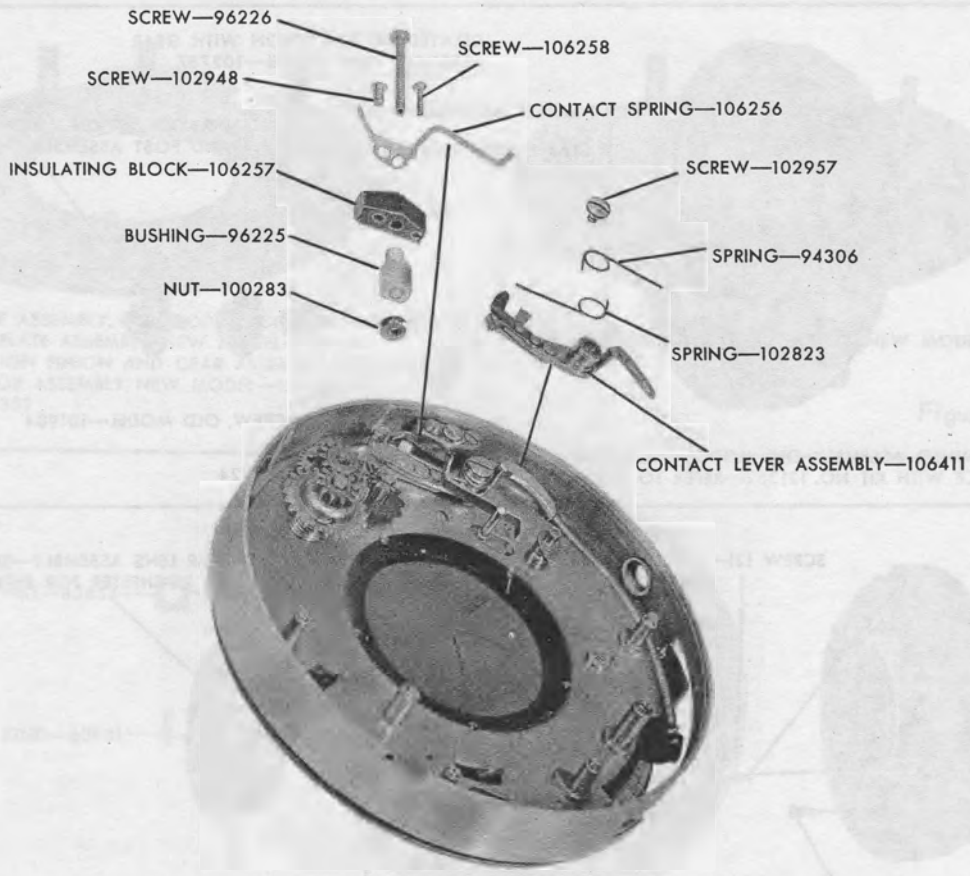



Figure 8




NEW MODEL PARTS

Figure 9

## OLD MODEL PARTS

*DISCONTINUED—REPLACE WITH KIT NO. 121352—REFER TO FIGURE 13

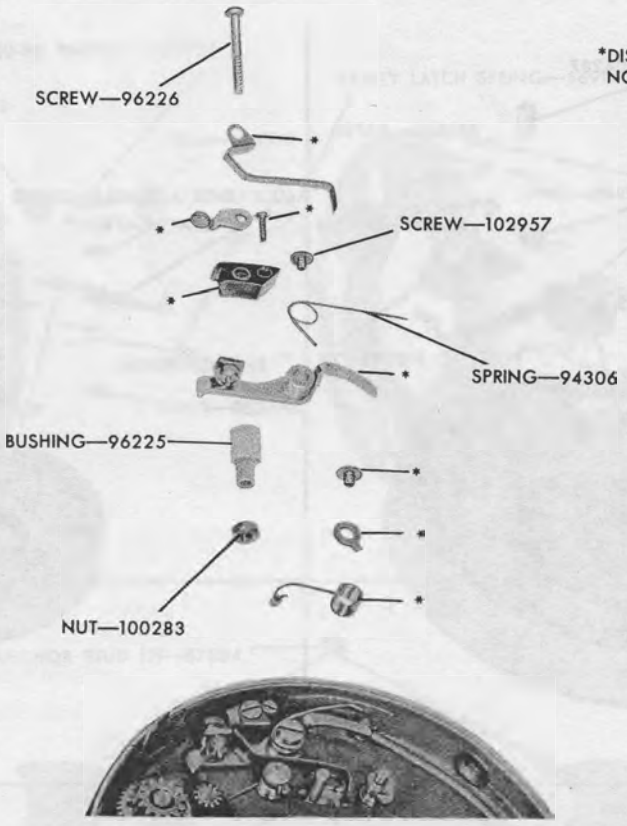



Figure 9A

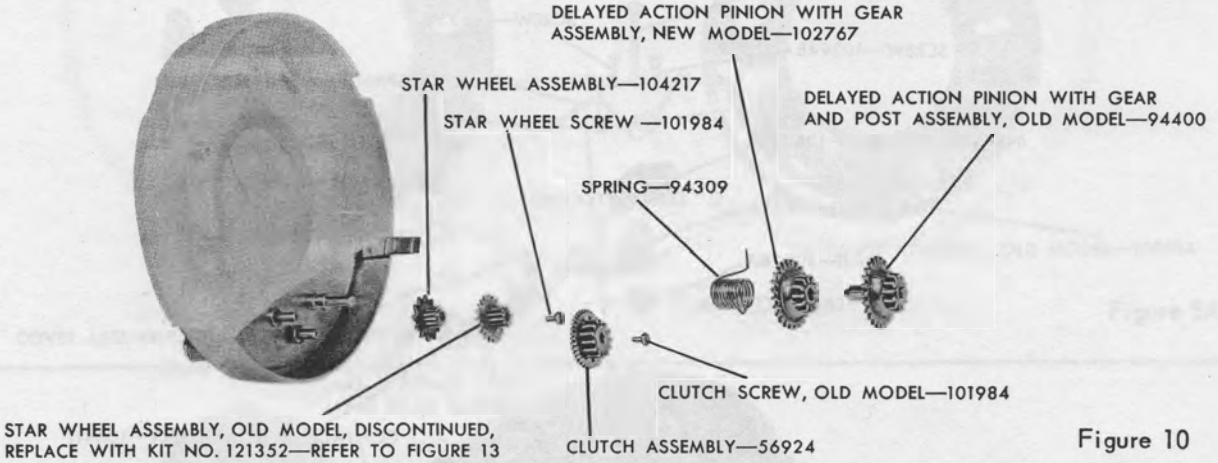

DELAYED ACTION PINION WITH GEAR ASSEMBLY, NEW MODEL—102767
STAR WHEEL ASSEMBLY—104217
STAR WHEEL SCREW —101984
DELAYED ACTION PINION WITH GEAR AND POST ASSEMBLY, OLD MODEL—94400
SPRING—94309
CLUTCH SCREW, OLD MODEL—101984
STAR WHEEL ASSEMBLY, OLD MODEL, DISCONTINUED, REPLACE WITH KIT NO. 121352—REFER TO FIGURE 13
CLUTCH ASSEMBLY—56924

Figure 10

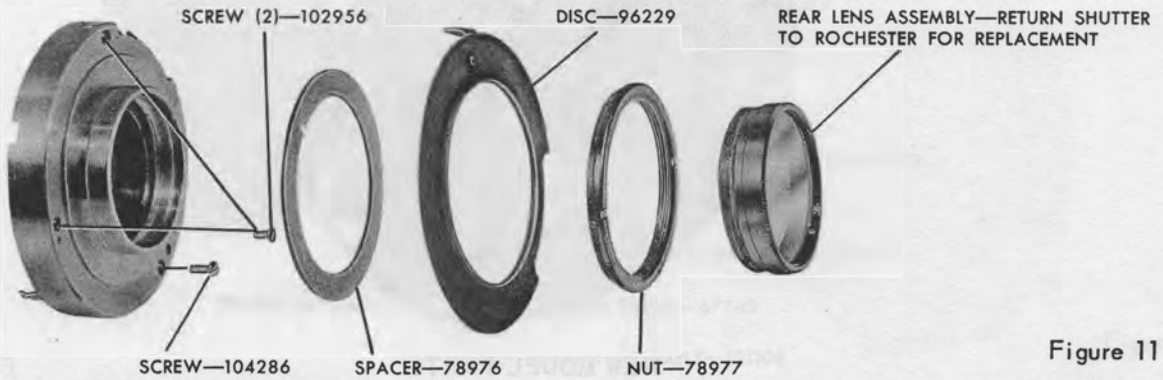



Figure 11

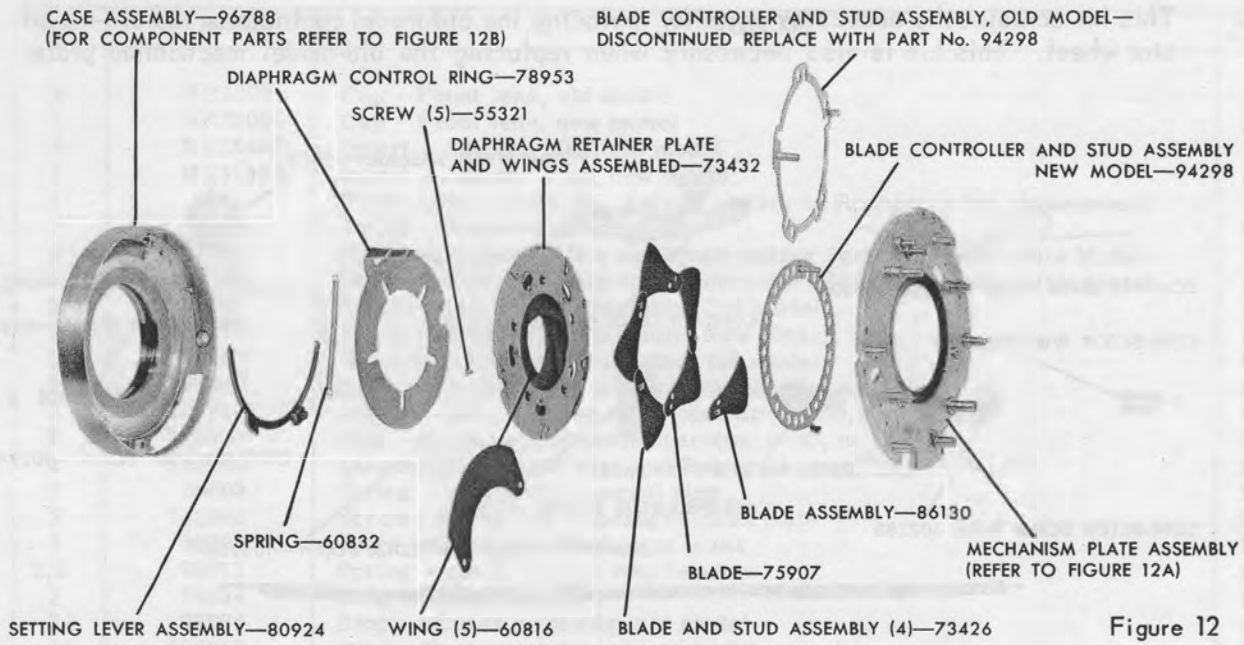



Figure 12

RETARD SECTOR AND STUD ASSEMBLY, OLD MODEL—95377
RETARD SECTOR AND STUD ASSEMBLY, NEW MODEL—121107
MECHANISM PLATE ASSEMBLY, OLD MODEL, DISCONTINUED, REPLACE WITH:
MECHANISM PLATE ASSEMBLY, NEW MODEL—122993
DELAYED ACTION PINION AND GEAR ASSEMBLY, NEW MODEL—102767
RETARD SECTOR ASSEMBLY, NEW MODEL—121107
KIT NO.—121352
MECHANISM PLATE ASSEMBLY, NEW MODEL—122993

Figure 12A

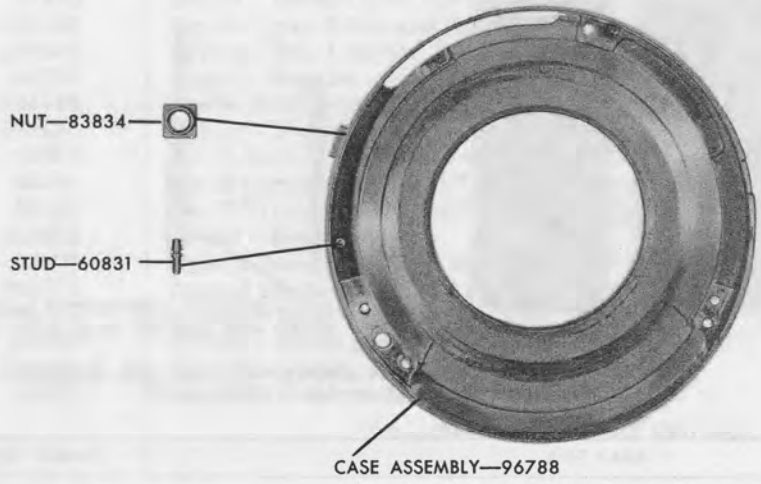



Figure 12B

## Kit No. 121352

This kit contains the necessary parts for replacing the old-model contacts or the old-model star wheel. This kit is also necessary when replacing the old-model mechanism plate.

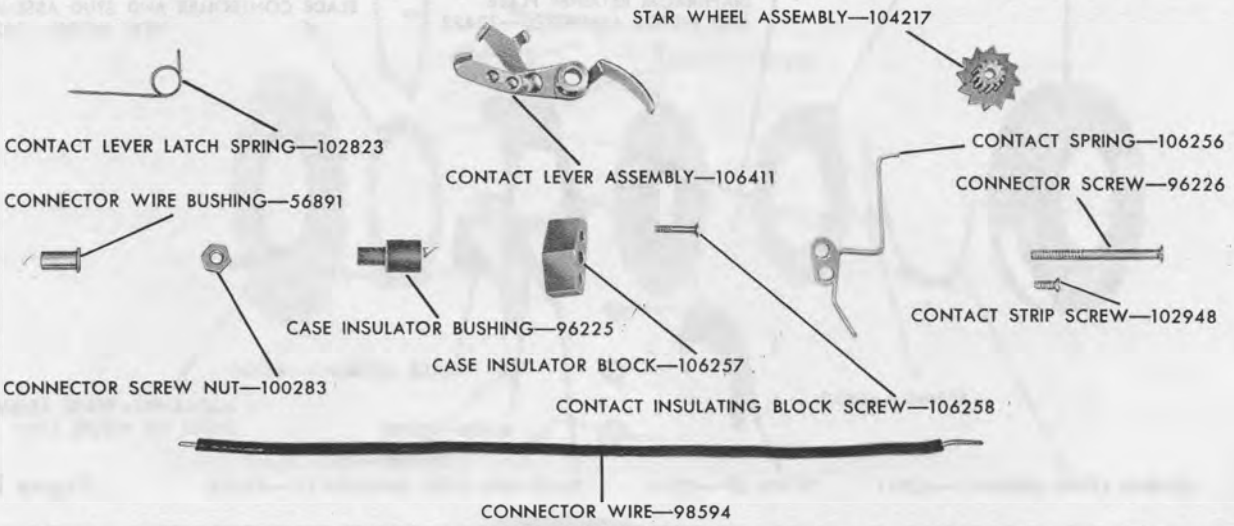



Figure 13

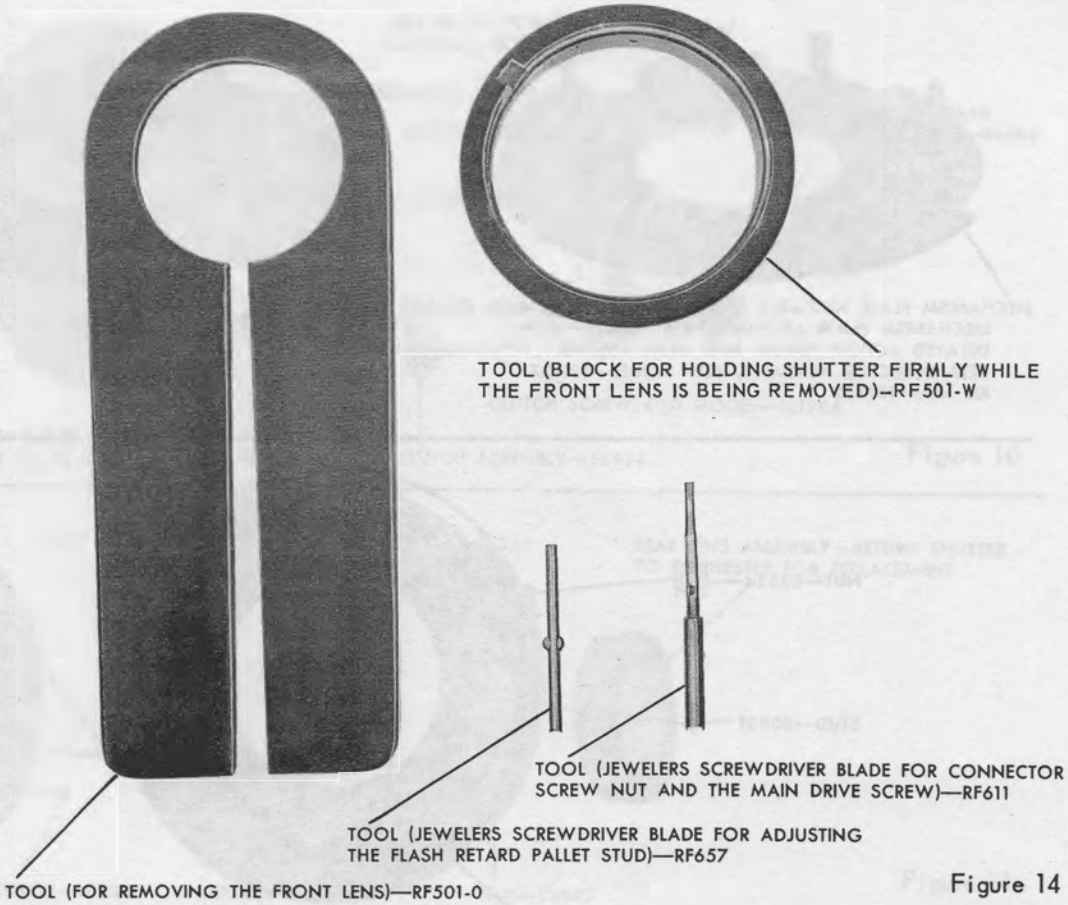

TOOL (BLOCK FOR HOLDING SHUTTER FIRMLY WHILE THE FRONT LENS IS BEING REMOVED)—RF501-W
TOOL (JEWELERS SCREWDRIVER BLADE FOR CONNECTOR SCREW NUT AND THE MAIN DRIVE SCREW)—RF611
TOOL (JEWELERS SCREWDRIVER BLADE FOR ADJUSTING THE FLASH RETARD PALLET STUD)—RF657
TOOL (FOR REMOVING THE FRONT LENS)—RF501-0

Figure 14

| FIG. | PART NUMBER | PART NAME | No. REQD. |
|---|---|---|---|
| 1 | HE28035 | Cap - Front lens, old model | 1 |
| 1 | HE25094 | Cap - Front lens, new model | 1 |
| 1 | HE25466 | Insert - Adapter ring, old model | 1 |
| 1 | HE31394 | Insert - Adapter ring, new model | 1 |
| 1 | | Front Lens Assembly - Return shutter to Rochester for replacement | 1 |
| 1 | 87025 | Screw - Diaphragm index plate | 3 |
| 2 | 96801 | Diaphragm Index Plate and Synchronizer Scale Assembly, Old Model | 1 |
| 2 | 107153 | Diaphragm Index Plate and Synchronizer Scale Assembly, New Model | 1 |
| 2 | 96797 | Synchronizer Scale Assembly, Old Model | 1 |
| 2 | 106316 | Synchronizer Scale Assembly, New Model | 1 |
| 2 | 96883 | Nut - Synchronizer scale stud, old model | 1 |
| 2 | 101808 | Knob - Synchronizer scale operating, new model | 1 |
| 2 | 101810 | Spring - Synchronizer scale operating knob, new model | 1 |
| 2 | 101809 | Stud - Synchronizer scale operating knob, new model | 1 |
| 2 | 102249 | Diaphragm Control Ring and Pointer Assembly, New Model | 1 |
| 2 | 86602 | Spring - Diaphragm control ring | 2 |
| 3 | 102998 | Screw - Speed and diaphragm index plate | 2 |
| 3 | 96227 | Plate - Speed and diaphragm index | 1 |
| 2,3 | 78971 | Spring - Speed control ring tension | 1 |
| 3 | 78954 | Ring - Speed control | 1 |
| 3A | 78974 | Ring - Shutter retaining, old model | 1 |
| 3A | 109817 | Ring - Shutter retaining, new model | 1 |
| 3 | 96218 | Lever - Winding | 1 |
| 4 | 94310 | Pallet - Flash retard (For average time lag shutters) | 1 |
| 4 | 100258 | Flash Retard Pallet Assembly (For less than average time lag shutters) | 1 |
| 4 | 43004 | Washer - Speed index anchor stud spacing | AR |
| 4 | 104954 | Screw - Winding lever stop | 1 |
| 4 | 75431 | Screw - Speed control ring stop | 1 |
| 4,5 | 102957 | Screw - Trigger latch spring-(1), Safety latch spring-(1), Contact lever-(1) | 3 |
| 4 | 94798 | Spring - Trigger latch | 1 |
| 4 | 96219 | Latch - Trigger | 1 |
| 4 | 80500 | Screw - Trigger latch | 1 |
| 5 | 102978 | Screw - Cover, short | 1 |
| 5 | 102979 | Screw - Cover, long | 2 |
| 5 | 56914 | Spring - Safety latch | 1 |
| 5 | 93073 | Cam - High speed spring | 1 |
| 5 | 102997 | Screw - Main drive (0-80 Thread) | 1 |
| 5 | 60828 | Spring - Main drive | 1 |
| 5A | 100014 | Cover Assembly, Old Model | 1 |
| 5A | 122619 | Cover Assembly, New Model | 1 |
| 5A | 87024 | Stud - Speed index plate anchor | 2 |
| 5A | 66163 | Stud - Delayed action safety latch | 1 |
| 5A | 66173 | Latch - Delayed action safety | 1 |
| 5A | 99801 | Stud - Pallet | 1 |
| 5A | 35625 | Rivet - Delayed action pinion bracket | 2 |
| 5A | 99803 | Bracket - Delayed action pinion | 1 |
| 6 | 83470 | Screw - Retard gear plate | 2 |
| 6 | 107460 | Retard Gear Plate and No. 1 Pinion Assembly | 1 |
| 6 | 103643 | Spring - No. 1 Sector | 1 |
| 6 | 67763 | Pallet - Retard | 1 |
| 6 | 121106 | Pallet Bracket and Stud Assembly | 1 |
| 6 | 102647 | Spring - Pallet bracket | 1 |
| 6 | 95379 | No. 2 Retard Pinion and Gear Assembly | 1 |
| 6 | 95381 | No. 4 Escapement Wheel and Pinion Assembly | 1 |
| 6 | 95380 | No. 3 Retard Pinion and Gear Assembly | 1 |
| 7 | 102954 | Screw - Retard sector | 1 |
| 12A | 95377 | Retard Sector and Stud Assembly, Old Model | |
| 12A | 121107 | Retard Sector and Stud Assembly, New Model | |
| 7 | 56911 | Spring - Retard sector | 1 |
| 7 | 62720 | Spring - Blade controller latch | 1 |
| 7 | 104287 | Bushing - Blade controller latch spring | 1 |
| 7 | 99532 | Main Drive Latch and Bushing Assembly | 1 |


| FIG. | PART NUMBER | PART NAME | No. REQD. |
|---|---|---|---|

| FIG. | PART NUMBER | PART NAME | No. REQD. |
|---|---|---|---|
| 7 | 79878 | Spring - Main drive | 1 |
| 8 | 102955 | Screw - Trigger | 1 |
| 8 | 96881 | Spring - Trigger | 1 |
| 8 | 56847 | Washer - Trigger | 1 |
| 8 | 80918 | Trigger Assembly | 1 |
| 8 | 78967 | Spacer - Bulb lever | 2 |
| 8 | 78979 | Bulb Lever Assembly | 1 |
| 8 | 78970 | Spring - Bulb lever | 1 |
| 9,9A | 102957 | Screw - Contact lever | 1 |
| 9,9A | 94306 | Spring - Contact lever | 1 |
| 9,13 | 102823 | Spring - Contact lever latch, new model | 1 |
| 9,13 | 106411 | Contact Lever Assembly, New Model | 1 |
| 9,9A,13 | 96226 | Screw - Connector | 1 |
| 9,13 | 102948 | Screw - Contact strip, new model | 1 |
| 9,13 | 106258 | Screw - Contact insulating block, new model | 1 |
| 9,13 | 106256 | Spring - Contact, New Model | 1 |
| 9,13 | 106257 | Block - Contact insulating, new model | 1 |
| 9,9A,13 | 96225 | Bushing - Case insulating | 1 |
| 9,9A,13 | 100283 | Nut - Connector screw | 1 |
| 10 | 94400 | No. 1 Delayed Action Pinion with Gear and Post Assembly, Old Model | 1 |
| 10 | 102767 | No. 1 Delayed Action Pinion and Gear Assembly, New Model | 1 |
| 10 | 94309 | Spring - No. 1 Delayed Action Pinion and Gear Assembly | 1 |
| 10 | 101984 | Screw - Clutch Assembly, Old Model-(1), Star Wheel Assembly-(1) | 2 |
| 10 | 56924 | Clutch Assembly | 1 |
| 10,13 | 104217 | Star Wheel Assembly | 1 |
| 11 | | Rear Lens Assembly - Return shutter to Rochester for replacement | 1 |
| 11 | 78977 | Nut - Shutter operating disc bearing | 1 |
| 11 | 96229 | Disc - Shutter operating | 1 |
| 11 | 78976 | Spacer - Shutter operating disc bearing | 1 |
| 11 | 102956 | Screw - Mechanism plate to case, short | 2 |
| 11 | 104286 | Screw - Mechanism plate to case, long | 1 |
| 12A | | Mechanism Plate Assembly, Old Model (Discontinued, replace with New Model Mechanism Plate Assembly 122993, New Model Delayed Action Pinion and Gear Assembly, 102767 and Kit No. 121352) | 1 |
| 12A | 122993 | Mechanism Plate Assembly, New Model | 1 |
| 12 | 94298 | Blade Controller and Stud Assembly, New Model | 1 |
| 12 | 86130 | Blade with Double Blade Bushing and Stud Assembly | 1 |
| 12 | 75907 | Blade | 1 |
| 12 | 73426 | Blade and Stud Assembly | 4 |
| 12 | 73432 | Diaphragm Retainer Plate and Wings Assembly | 1 |
| 12 | 60816 | Wing - Diaphragm | 5 |
| 12 | 55321 | Screw - Diaphragm retainer plate to mechanism plate | 5 |
| 12 | 78953 | Ring - Diaphragm control | 1 |
| 12 | 60832 | Spring - Setting lever | 1 |
| 12 | 80924 | Setting Lever Assembly | 1 |
| 12 | 96788 | Case Assembly | 1 |
| 12B | 83434 | Nut - Cable release | 1 |
| 12B | 60831 | Stud - Setting lever spring | 1 |
| 13 | 56891 | Bushing - Connector wire | 1 |
| 13 | 98594 | Wire - Connector | 1 |
| 13 | 121352 | Kit - (For replacing Old Model Star Wheel, Old Model Mechanism Plate Assembly, and the Old Model Flash Contact Parts) | 1 |
| 14 | RF501-O | Tool (For removing the Front Lens) | 1 |
| 14 | RF501-W | Tool (Block for holding shutter firmly while the Front Lens is being removed) | 1 |
| 14 | RF611 | Tool (Jeweler's Screwdriver blade for Connector Screw Nut and Main Drive Screw) | 1 |
| 14 | RF657 | Tool (Jeweler's screwdriver blade for adjusting the Flash Retard Pallet Stud) | 1 |

| FIG. | PART NUMBER | PART NAME | No. REQD. |

Numerical List

| PART NUMBER | PARTS LIST PAGE NUMBERS | FIGURE No. | PART NUMBER | PARTS LIST PAGE NUMBERS | FIGURE No. | PART NUMBER | PARTS LIST PAGE NUMBERS | FIGURE No. |
|---|---|---|---|---|---|---|---|---|
| RF501-O | 10 | 14 | 80500 | 9 | 4 | 100283 | 10 | 9,9A,13 |
| RF501-W | 10 | 14 | 80917 | 9 | 2 | 101808 | 9 | 2 |
| RF611 | 10 | 14 | 80918 | 10 | 8 | 101809 | 9 | 2 |
| RF657 | 10 | 14 | 80924 | 10 | 12 | 101810 | 9 | 2 |
| HE25094 | 9 | 1 | 83434 | 10 | 12B | 101984 | 10 | 10 |
| HE25466 | 9 | 1 | 83470 | 9 | 6 | 102249 | 9 | 2 |
| HE28035 | 9 | 1 | 86130 | 10 | 12 | 102647 | 9 | 6 |
| HE31394 | 9 | 1 | 86602 | 9 | 2 | 102767 | 10 | 10 |
| 35625 | 9 | 5A | 87024 | 9 | 5A | 102823 | 10 | 9,13 |
| 43004 | 9 | 4 | 87025 | 9 | 1 | 102948 | 10 | 9,13 |
| 55321 | 10 | 12 | 93073 | 9 | 5 | 102954 | 9 | 7 |
| 56847 | 10 | 8 | 94298 | 10 | 12 | 102955 | 10 | 8 |
| 56891 | 10 | 13 | 94306 | 10 | 9,9A | 102956 | 10 | 11 |
| 56911 | 9 | 7 | 94309 | 10 | 10 | 102957 | 9,10 | 4,5, |
| 56914 | 9 | 5 | 94310 | 9 | 4 | | | 9,9A |
| 56924 | 10 | 10 | 94400 | 10 | 10 | 102978 | 9 | 5 |
| 60816 | 10 | 12 | 94798 | 9 | 4 | 102979 | 9 | 5 |
| 60828 | 9 | 5 | 95377 | 9 | 12A | 102997 | 9 | 5 |
| 60831 | 10 | 12B | 95379 | 9 | 6 | 102998 | 9 | 3 |
| 60832 | 10 | 12 | 95380 | 9 | 6 | 103643 | 9 | 6 |
| 62720 | 9 | 7 | 95381 | 9 | 6 | 104217 | 10 | 10,13 |
| 66163 | 9 | 5A | 96218 | 9 | 3 | 104286 | 10 | 11 |
| 66173 | 9 | 5A | 96219 | 9 | 4 | 104287 | 9 | 7 |
| 67763 | 9 | 6 | 96225 | 10 | 9,9A,13 | 104954 | 9 | 4 |
| 73426 | 10 | 12 | 96226 | 10 | 9,9A,13 | 106256 | 10 | 9,13 |
| 73432 | 10 | 12 | 96227 | 9 | 3 | 106257 | 10 | 9,13 |
| 75431 | 9 | 4 | 96229 | 10 | 11 | 106258 | 10 | 9,13 |
| 75907 | 10 | 12 | 96788 | 10 | 12 | 106316 | 9 | 2 |
| 78953 | 10 | 12 | 96797 | 9 | 2 | 106411 | 10 | 9,13 |
| 78954 | 9 | 3 | 96801 | 9 | 2 | 107153 | 9 | 2 |
| 78967 | 10 | 8 | 96881 | 10 | 8 | 107460 | 9 | 6 |
| 78970 | 10 | 8 | 96883 | 9 | 2 | 109817 | 9 | 3A |
| 78971 | 9 | 2,3 | 98594 | 10 | 13 | 121106 | 9 | 6 |
| 78974 | 9 | 3A | 99532 | 9 | 7 | 121107 | 9 | 12A |
| 78976 | 10 | 11 | 99801 | 9 | 5A | 121352 | 10 | 13 |
| 78977 | 10 | 11 | 99803 | 9 | 5A | 122619 | 9 | 5A |
| 78979 | 10 | 8 | 100014 | 9 | 5A | 122993 | 10 | 12A |
| 78978 | 10 | 7 | 100258 | 9 | 4 | | | |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